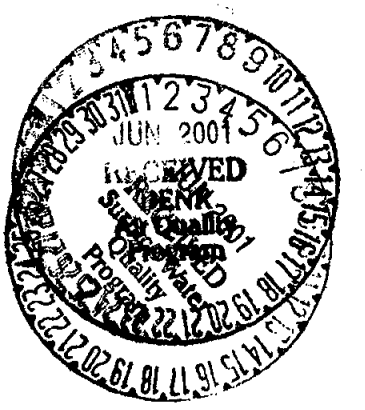
215 South Cascade Street
PO Box 496
Fergus Falls, Minnesota 56538-0496
218 739-8200
www.otpco.com (web site)




OTTER TAIL
Power Company

June 4, 2001

Mr. Brian Gustafson
Air Quality Administrator
Division of Environmental Services
South Dakota Department of Environment
and Natural Resources
Joe Foss Building
523 East Capitol
Pierre, SD 57501-3181

Dear Mr. Gustafson:

SUBJECT: BIG STONE PLANT – RENEWAL APPLICATION FOR TITLE V PERMIT
PERMIT NUMBER 28.0801-29

Enclosed are an original and a copy of the Title V Permit Application 2001 for the Big Stone Plant that is located near Big Stone City, South Dakota. Otter Tail Power Company is filing the application on behalf of the three Big Stone Plant co-owners, Montana-Dakota Utilities Co., NorthWestern Public Service, and Otter Tail Power Company.

For your information, on April 9, 2001, Otter Tail Power Company changed its corporate name to Otter Tail Corporation. Nevertheless, the Otter Tail Power Company name continues to be used with reference to the electrical operations portion of our corporate structure.

Otter Tail is proposing to make a change to the emissions and emissions control equipment that is identified in the current permit as Unit 9 – North fuel conveying system and silo vents and Unit 10 - South fuel conveying system, silo vents, and plant distribution bin. One of the reasons for the change is to improve the effectiveness of the in-plant dust collection system. No changes will be made to the system that in any way affects the handling capacity of the coal handling system.

Enclosed is a sketch that illustrates the configuration of the existing dust collection system and the configuration of the new system. The north and south conveyors and conveyor transfer point that is near the distribution bin will be reconfigured. The conveyors will be sealed using air supported conveyor technology which will prevent discharge of emissions into the boiler building or the environment. Collectors will be added to the coal transfers points. Those collectors will discharge into the boiler building. Individual dust collectors will also be installed on each of the twelve coal silos. The suction for the dust collectors will be supplied from two common fans, each fan will serve six coal silo filters. Each of the fans will discharge at the same location as the existing units 9 and 10.

The enclosed permit application forms describe each process change and the associated control equipment that will be installed following the change. Please note that the inlet air flow on each unit is 15,000 CFM. The total flow of both replacement systems is slightly less than the total air flow of the current system. The manufacturer expects that the replacement dust collectors will typically meet an outlet emissions level of 0.0044 to 0.0088 grains per cubic foot. Thus, we fully expect hourly emissions to be lower than current levels.

Reconfiguration of a portion of the coal handling system will take place in June of 2001. All control equipment discharges from this portion of the project will be into the boiler building. The remaining changes, including removal of the existing fabric filter and installation of the fans and fabric filters on the coal silos, are scheduled to take place in September 2001.

Based on our interpretation of ARSD 74:36:05:33, Otter Tail has the flexibility to make the change at the source within seven days of providing notification to the Department of Environment and Natural Resources. Furthermore, it is our opinion that the proposed replacement of the fabric filters for the coal silos meets the criteria of a minor permit amendment. However, Section 3.3 of our current permit does not allow us to proceed with the project unless it is approved by the Department. Consequently, Otter Tail hereby provides notice of the proposed change to the coal silo dust collection system and requests Department approval of the change as required in Section 3.3 of Permit #28.0801-29. We further request that the proposed changes be included in the Title V Permit when it is reissued.

Should you have any questions on the application, please contact me at 218-739-8407.

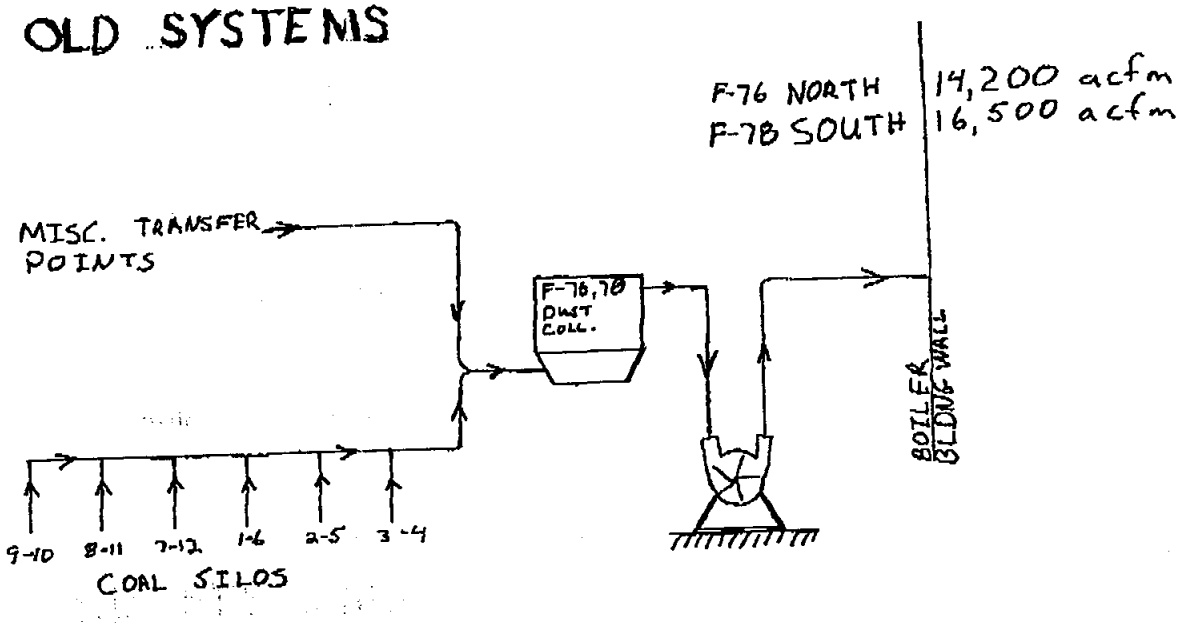
Sincerely,

Terry Graumann
Manager, Environmental Services

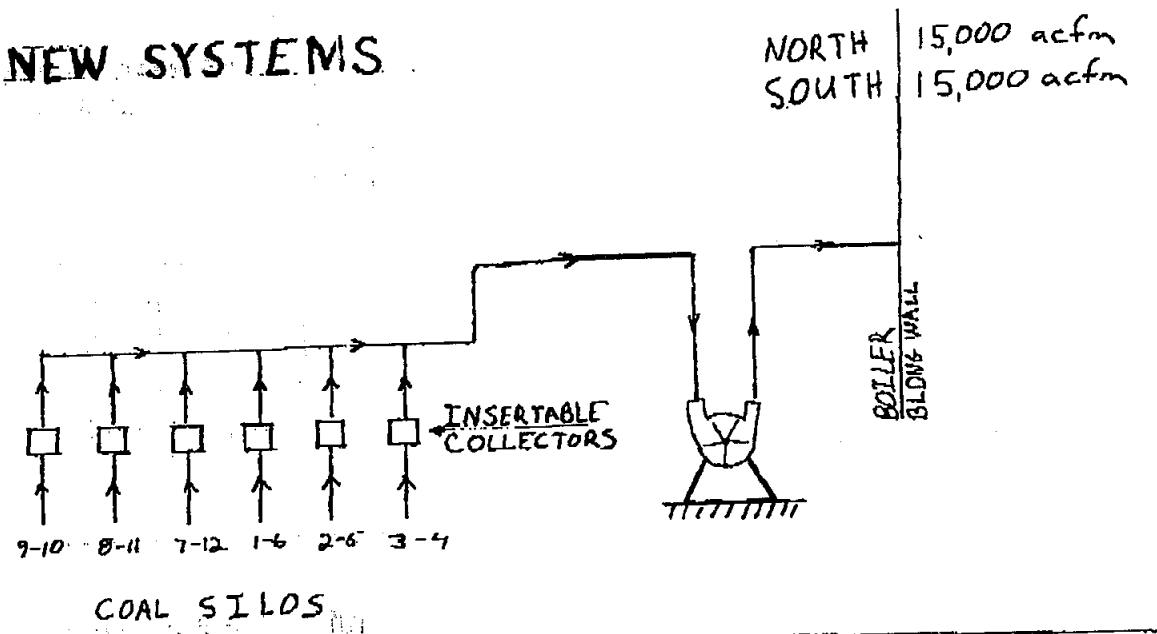
Enclosures

C: Gary Gress MDU w/enclosure
Dennis Wagner – NWPS w/enclosure
Dennis Bowman – w/o enclosure

# OLD SYSTEMS




# NEW SYSTEMS




PROPOSED DUST COLL. SYSTEM FOR BIG STONE COAL GALLEY
W. SWANSON 5/16/2001

## MISCELLANEOUS PROCESS OPERATION

1. Facility identification (i.e., Unit #1, Pierre Plant, etc.): Big Stone Plant – North fuel silo vents (North conveying system scheduled for conversion to dust control system discharging internal to the facility building in June of 2001.)

2. Manufacturer: _____

   Date of manufacture: 1974 Model number:

3. Maximum design operating rate:

   Amount of material processed, consumed, or produced? 550 tons per hour
   or
   _____ pounds per hour
   or
   _____ gallons per hour
   or

   **(please specify units)**

   Heat source (if applicable)? _____ million Btus per hour heat input

4. Actual or anticipated operation:

   Type of material processed, consumed, or produced? Materials handing of approved solid, primary and secondary fuel

   **If applicable, please provide MSDS forms for each type of chemical(s) utilized in the process.**

   Amount of material processed, consumed, or produced? Btu equivalent of up to 1,135,000 tons per year of subbituminous coal (please specify units)

   Primary and secondary fuel, fuel consumption, and fuel parameters (if applicable):

| Description | Primary Fuel | Secondary Fuel |
|---|---|---|
| Fuel Type **(i.e., natural gas, #2 fuel oil, lignite coal, etc.)** | | |
| Fuel Consumption **(i.e., cubic feet/hour, gallons/hour, pound/hour, tons/hour, etc.)** | | |
| Heating value **(i.e., Btus/cubic feet, Btus/gallon, Btus/pound, etc.)** | | |
| Sulfur Content (Wt.%) | | |
| Ash Content (Wt.%) | | |

5. Has a stack test or other forms of testing been conducted? Yes _____ No _X_

If a stack test or other forms of testing have been conducted, please attach a copy of the most recent report to this application and skip item #6. If the Department already has a copy of the most recent stack test or other testing methods, please specify the date of the most recent test:

Most recent test date:

6. Stack information (if a stack is present): Baghouse outlet

Stack height (feet): _128 feet_ Stack diameter (feet): _2 x 2 feet_

7. Type of air pollution control equipment: Baghouse
(Examples: wet scrubber, cyclone, baghouse, electrostatic precipitator, etc.)

**Please complete the appropriate air pollution control equipment data sheet(s) for this unit.**

# BAGHOUSE DATA SHEET

**Company name:** Otter Tail Power Company

**Company Location:** Big Stone Plant

**Emission Unit(s) served by this baghouse(please list all units):**

1. North Fuel Silo Vents
2. 
3. 

**Manufacturer Information:**

Manufacturer: Donaldson/DCE – Model V30/15H (one unit on each of six coal silos)

Manufacturer date: 2001 Installation date: September 2001

Manufacturer's designed control efficiency: 99.96+ %
(Expected outlet concentration - 0.0044 to 0.0088 grains per cubic foot)
Type of baghouse (please check one): Reverse air _____ Pulse Jet X Shaker _____ Other

Type of bags: Polyester

Number of bags: 20 elements – 323 sq./ft.

Air/Cloth Ratio: 7.74 / 1

**Facility Operation and Maintenance:**

Pressure drop across baghouse: 3 to 7 inches $H_2O$ (normal) 10 inches $H_2O$ (maximum)

Inlet Temperature: 40 ℉ (minimum) 120 ℉ (maximum)

Outlet Temperature: _____ ℉ (minimum) _____ ℉ (maximum)

Inlet air flow rate: 15,000 CFM (one common fan - total air flow from all six units)

Describe maintenance of baghouse (use of dye test, visual inspections, changing bags, etc.):

Inspection and maintenance will be as per the manufacturer's recommended procedures.

## MISCELLANEOUS PROCESS OPERATION

1. Facility identification (i.e., Unit #1, Pierre Plant, etc.): Big Stone Plant – South fuel silo vents (South conveying system and distribution bin scheduled for conversion to dust control system discharging internal to the facility building in June of 2001.)

2. Manufacturer: _____

   Date of manufacture: 1974 Model number:

3. Maximum design operating rate:

   Amount of material processed, consumed, or produced? 550 tons per hour
   or
   _____ pounds per hour
   or
   _____ gallons per hour
   or

   **(please specify units)**

   Heat source (if applicable)? _____ million Btus per hour heat input

4. Actual or anticipated operation:

   Type of material processed, consumed, or produced? Materials handling of approved solid, primary and secondary fuel

   **If applicable, please provide MSDS forms for each type of chemical(s) utilized in the process.**

   Amount of material processed, consumed, or produced? Btu equivalent of up to 1,135,000 tons per year of subbituminous coal (please specify units)

   Primary and secondary fuel, fuel consumption, and fuel parameters (if applicable):

| Description | Primary Fuel | Secondary Fuel |
|---|---|---|
| Fuel Type **(i.e., natural gas, #2 fuel oil, lignite coal, etc.)** | | |
| Fuel Consumption **(i.e., cubic feet/hour, gallons/hour, pound/hour, tons/hour, etc.)** | | |
| Heating value **(i.e., Btus/cubic feet, Btus/gallon, Btus/pound, etc.)** | | |
| Sulfur Content (Wt. %) | | |
| Ash Content (Wt. %) | | |

5. Has a stack test or other forms of testing been conducted? Yes _____ No X

If a stack test or other forms of testing have been conducted, please attach a copy of the most recent report to this application and skip item #6. If the Department already has a copy of the most recent stack test or other testing methods, please specify the date of the most recent test:

Most recent test date:

6. Stack information (if a stack is present): Baghouse outlet

Stack height (feet): 128 Stack diameter (feet): 2 x 2 feet

7. Type of air pollution control equipment: Baghouse
(Examples: wet scrubber, cyclone, baghouse, electrostatic precipitator, etc.)

**Please complete the appropriate air pollution control equipment data sheet(s) for this unit.**

# BAGHOUSE DATA SHEET

**Company name:** Otter Tail Power Company

**Company Location:** Big Stone Plant

**Emission Unit(s) served by this baghouse(please list all units):**

1. South Fuel Silo Vents
2. 
3. 

**Manufacturer Information:**

Manufacturer: Donaldson/DCE – Model V30/15H (one unit on each of six coal silos)

Manufacturer date: 2001 Installation date: September 2001

Manufacturer's designed control efficiency: 99.96+ %
(Expected outlet concentration - 0.0044 to 0.0088 grains per cubic foot)
Type of baghouse (please check one): Reverse air _____ Pulse Jet X Shaker _____ Other

Type of bags: Polyester

Number of bags: 20 elements – 323 sq./ft.

Air/Cloth Ratio: 7.74 / 1

**Facility Operation and Maintenance:**

Pressure drop across baghouse: 3 to 7 inches $H_2O$ (normal) 10 inches $H_2O$ (maximum)

Inlet Temperature: 40 ℉ (minimum) 120 ℉ (maximum)

Outlet Temperature: _____ ℉ (minimum) _____ ℉ (maximum)

Inlet air flow rate: 15,000 CFM (one common fan - total air flow from all six units)

Describe maintenance of baghouse (use of dye test, visual inspections, changing bags, etc.):

Inspection and maintenance will be as per the manufacturer's recommended procedures.

BIG STONE PLANT
TITLE V OPERATING PERMIT APPLICATION
2001
TABLE OF CONTENTS

Department of Environment and Natural Resources
Air Quality Program
Joe Foss Building
523 East Capitol
[illegible]e, SD 57501-3181
[illegible]phone: (605) 773-3151

STATE OF SOUTH DAKOTA

BEFORE THE SECRETARY OF

THE DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES

IN THE MATTER OF THE APPLICATION OF _____ Big Stone Plant (FACILITY NAME) STATE OF South Dakota COUNTY OF Grant ) SS

**CERTIFICATION OF APPLICANT**

I, Ward L. Uggerud, the applicant in the above matter after being duly sworn upon oath hereby certify the following information in regard to this application:

South Dakota Codified Laws Section 1-40-27 provides:

*"The secretary may reject an application for any permit filed pursuant to Titles 34A or 45, including any application by any concentrated swine feeding operation for authorization to operate under a general permit, upon making a specific finding that:*

*(1) The applicant is unsuited or unqualified to perform the obligations of a permit holder based upon a finding that the applicant, any officer, director, partner or resident general manager of the facility for which application has been made:*

*(a) Has intentionally misrepresented a material fact in applying for a permit;*

*(b) Has been convicted of a felony or other crime involving moral turpitude;*

*(c) Has habitually and intentionally violated environmental laws of any state or the United States which have caused significant and material environmental damage;*

*(d) Has had any permit revoked under the environmental laws of any state or the United States; or*

*(e) Has otherwise demonstrated through clear and convincing evidence of previous actions that the applicant lacks the necessary good character and competency to reliably carry out the obligations imposed by law upon the permit holder; or*

*(2) The application substantially duplicates an application by the same applicant denied within the past five years which denial has not been reversed by a court of competent jurisdiction. Nothing in this subdivision may be construed to prohibit an applicant from submitting a new application for a permit previously denied, if the new application represents a good faith attempt by the applicant to correct the deficiencies that served as the basis for the denial in the original application.*

*All applications filed pursuant to Titles 34A and 45 shall include a certification, sworn to under oath and signed by the applicant, that he is not disqualified by reason of this section from obtaining a permit. In the absence of evidence to the contrary, that certification shall constitute a prima facie showing of the suitability and qualification of the applicant. If at any point in the application review, recommendation or hearing process, the secretary finds the applicant has intentionally made any material misrepresentation of fact in regard to this certification, consideration of the application may be suspended and the application may be rejected as provided for under this section.*

*Applications rejected pursuant to this section constitute final agency action upon that application and may be appealed to circuit court as provided for under chapter 1-26."*

Pursuant to SDCL 1-40-27, I certify that I have read the forgoing provision of state law, and that I am not disqualified by reason of that provision from obtaining the permit for which application has been made.

Dated this 4th, day of June, ~~19~~2001

Ward Uggerud
Applicant

Subscribed and sworn before me this 4th day of June, ~~19~~2001

Deborah A Kleven
Notary Public

My commission expires: 1/31/05

(SEAL)

DEBORAH A. KLEVEN
NOTARY PUBLIC-MINNESOTA
My Commission Expires Jan. 31, 2005

**PLEASE ATTACH SHEET DISCLOSING ALL FACTS PERTAINING TO SDCL 1-40-27 (1) (a) THROUGH (e). ALL VIOLATIONS MUST BE DISCLOSED, BUT WILL NOT AUTOMATICALLY RESULT IN THE REJECTION OF AN APPLICATION.**

BIG STONE PLANT
PART 70 OPERATING PERMIT APPLICATION
AIR POLLUTION CONTROL EMISSION LIMIT REQUIREMENTS

As required by the Administrative Rules of South Dakota, Rule 74:36::05:12 paragraph 8, the following are a citations of all air pollution control emission limit requirements that are applicable to Big Stone Plant which are known to Otter Tail Power Company:

| CITATION | DESCRIPTION |
|---|---|
| Portions of the Clean Air Act and its amendments of 1977 and 1990 | Requires compliance with rules developed pursuant to Title I (State Implementation Plans), Title IV (Acid Rain Program), Title V (Operating Permits), and Title VII (Enforcement) |
| ARSD Chapter 74:36:02 | Requires that facility emissions comply with ambient air quality standards |
| ARSD Chapter 74:36:05 | Requires an operating permit and associated permit application, permit compliance, permit modification, PSD and New Source Review, permit monitoring, and record keeping for Part 70 sources, which includes Big Stone Plant |
| ARSD Section 74:36:06:02 | Defines allowable emissions of particulates and SO2 for fuel-burning units including the main boiler, auxiliary boiler, heating boiler, and the emergency diesel generator |
| ARSD Section 74:36:06:03 | Defines allowable emissions for process industry units, including all of Big Stone Plant's materials handling systems |
| 40 CFR 60.51(a) as referenced in 74:36:07:07 | Allows Big Stone Plant to operate as a synthetic minor for purposes of co-firing municipal solid waste or refuse-derived fuel if fuel use is restricted by permit to 30% or less by weight, in aggregate, of MSW or RDF on a 24-hour daily basis |
| ARSD Chapter 74:36:12 | Sources are required to limit the discharge to the ambient air from each emissions unit of an air pollutant of a density equal to or greater than 20% opacity |
| ARSD Chapter 74:36:15 | Allows open burning of refuse in rural areas |

| CITATION | DESCRIPTION |
|---|---|
| ARSD Chapter 74:36:16:02 | Requires compliance with SO2 allowance system as specified in 40 CFR Part 73 |
| ARSD Chapter 74:36:16:05 | Requires NOx emission reduction requirements as specified in 40 CFR Part 76, which is applicable to Big Stone Plant Unit 1 |
| ARSD 74:28:31:04 | Allows for disposal of PCB-contaminated mineral oil dielectric fluid containing 50 ppm PCB or more but less than 500 ppm if the boiler meets specified conditions |
| 40 CFR 761.20(e)(3) as referenced in ARSD 74:28:31:02 | Allows used oil containing less than 50 ppm PCB to be used as fuel under specified conditions |
| 40 CFR 266.100(b)(3) and 40 CFR 279.10 (b)(3) as referenced in ARSD Article 74:28:22:01 | Allows conditionally exempt small quantity hazardous waste generators to use the waste for energy recovery. Example - Waste solvents |
| 40 CFR Part 279 Subpart G as referenced in ARSD Article 74:28:27:01 | Allows off-specification used oil and materials contaminated with used oil (i.e. filters, floor dry, referenced in 40 CFR 279.10 (c)(2)), to be burned in utility boilers for energy recovery |
| 40 CFR Part 60 Subpart K 60.111(b) as referenced in ARSD 74:36:07:12 | Excludes No. 2 fuel oil from the definition of a petroleum liquid requiring storage in vessels meeting new source performance standards |

## TITLE V AIR QUALITY OPERATING PERMIT APPLICATION

## SOUTH DAKOTA DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES

**SEND ALL MATERIALS TO:**
SD Department of Environment and Natural Resources
Air Quality Program
523 East Capitol
Pierre, South Dakota 57501-3181
Phone: (605) 773-3151 Fax: (605) 773-5286

## A. GENERAL INFORMATION

1. Facility name: Otter Tail Power Company – Big Stone Plant

2. Mailing address:

   Street and/or box number: 215 South Cascade Street P. O. Box 496

   City, state, zip code: Fergus Falls, MN 56538-0496

3. Facility location (if plant is portable, enter location at time of submittal):

   Street and city and/or Legal description and county: Northwest of Big Stone City, South Dakota

   Portions of Section 11 and 12, Twp 121N Range 47W and Section 7 Twp 121 N Range 46W Grant County South Dakota

   **(Quarter, Section, Township, Range)**

4. Permit contact:

   Name/title: Terry Graumann, Manager, Environmental Services

   Telephone number: 218-739-8407

5. Facility contact, if different than permit contact (Person to contact for arranging inspections):

   Name/title: Mark Rolfes, Plant Manager

   Telephone number: 605-862-6300

6. Responsible official:

   Name/title: Terry Graumann, Manager, Environmental Services

   Telephone number: 218-739-8407

**A responsible official is defined as a president, vice president, secretary, or treasurer for a corporation; general partner or the proprietor for a partnership; and principal executive officer or ranking elected official for municipal, state, federal or public agency.**

## B. PLANT DESCRIPTION

1. Standard Industrial Classification Code (SIC code):

**Please contact the Department if unable to determine your SIC code.**

Primary SIC code: 4911 Secondary SIC code (if applicable):

2. Briefly describe the operations at the facility, including raw materials and finished products:

The facility is a steam to electric energy conversion facility. It also supplies steam to the Northern Corn Growers Ethanol Plant. The facility uses solid fossil fuels as the primary source of energy.

**Please attach one copy, if available, of any prepared plans and the manufacturers specifications of any equipment, including pollution control devices. If additional space is needed to describe operations, please attach the additional paper to this application.**

3. A new source or modification to an existing source, which has the potential to increase emissions, is required to demonstrate that the operation of the new source or modification will not prevent or interfere with the attainment or maintenance of an applicable ambient air quality standard. Please attach air dispersion modeling or other documents which will demonstrate the new source or modification will not prevent or interfere with the attainment or maintenance of an applicable ambient air quality standard.

Has air dispersion modeling been conducted? Yes ___ No N/A

***If air dispersion modeling has been conducted, please attach a copy of the report to this application unless the Department has a copy already.***

## C. COMPLIANCE PLAN

If it is anticipated that a permitted unit will not be operating in compliance at the time of permit issuance, a proposed compliance plan shall be included with the application. The proposed compliance plan shall include a narrative description of the following:

1. The requirements (i.e., statutes, air quality rules, permit conditions, etc.) the source is not in compliance with at the time of submittal of this application or permit issuance;

2. How the facility intends to bring the unit(s) into compliance; and

3. A compliance schedule for when the source will achieve compliance with such requirements;

The compliance schedule must include a statement that progress reports will be submitted at least once every six months and must be at least as stringent as that contained in any judicial consent decree or administrative order to which the applicant is subject.

## D. MAPS

**For stationary sources only**, please enclose a map or a drawing showing roadways, location of plant and the nearest residents in each direction from the source. Include other structures which may be affected.

(On file with the Department of Environment and Natural Resources)

## E. AIR QUALITY EMISSIONS SUMMARY

See Tab D for List of Insignificant Activities

If air quality emissions are available, please complete the following table:

| Pollutant | Actual (tons per year) | Potential Controlled (tons per year) | Potential Uncontrolled (tons per year) |
|---|---|---|---|
| Particulates | See Tab E | See Tab F | |
| Sulfur Dioxide | See Tab E | | See Tab F |
| Nitrogen Oxide | See Tab E | See Tab F | |
| Volatile Organic Compounds | See Tab E | | See Tab F |
| Hazardous Air Pollutants | See Tab E | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

Remember that potential emissions are calculated assuming that the permitted unit is operated 24 hours per day, 7 days per week, 52 weeks per year at maximum design capacity.

Attach all calculations and supporting documentations.

**Please contact the Department if assistence is needed for calculating emissions for the permitted units such as emission factors, clarifying what potential emissions are, efficiency for control equipment, etc.**

## F. CERTIFICATION OF COMPLIANCE

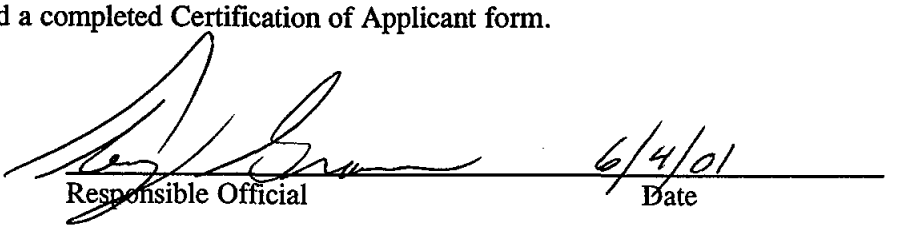
I certify the following:

1. The methods such as monitoring, record keeping, reporting, and stack test performance results described within this application shall be used to determine continuous or intermittent compliance;

2. A compliance certification document will be submitted to the Department at least annually or at other times designated by the Department for the duration of the permit;

3. The source is in compliance and will continue to demonstrate compliance with all applicable requirements, except for those designated in the attached compliance plan (if applicable); and

4. This application is submitted in accordance with the provisions of the South Dakota Codified Laws 34A-1 and Administrative Rules of South Dakota 74:36. To the best of my knowledge, after reasonable inquiry, the statements and information contained in the application and supporting documents are true, accurate, and complete. In accordance with South Dakota Codified Laws 1-40-27, I have also enclosed a completed Certification of Applicant form.



Responsible Official — Date: 6/4/01

Otter Tail Power Company

Company Name

BIG STONE PLANT
INSIGNIFICANT ACTIVITIES

The following emissions units were evaluated as to their applicability for inclusion in Big Stone Plant's Part 70 Operating Permit application. Based on the Administrative Rules of South Dakota, 74:36:05:04:01, it is Otter Tail's opinion that they are insignificant activities for purposes of the permit application.

| ACTIVITY | PARA. 74:36::05:04:01 EXEMPTION REFERENCE |
|---|---|
| EMERGENCY DIESEL FIRE PUMP RATED AT 280 H.P. - EST. FUEL USE 12 GAL. PER HOUR | PARA. 4 - HEAT INPUT OF NOT MORE THAN 3,500,000 BTU (25 GAL. OF NO. 2 FUEL OIL) PER HOUR |
| PORTABLE ELECTRIC AND OXY/ACETYLENE WELDING UNITS | PARA. 6 - ROUTINE HOUSEKEEPING AND PLANT UPKEEP ACTIVITIES |
| DOZER, FRONT-END LOADER, SKID STEER-LOADER, TRUCKS, VANS, PICKUPS, ETC | PARA. 2 - MOBILE INTERNAL COMBUSTION ENGINE |
| PAINTING, PAVING, RETARRING ROOFS, AND OTHER COATING APPLICATIONS | PARA. 6 - ROUTINE HOUSEKEEPING AND PLANT UPKEEP ACTIVITIES |
| PRECIPITATOR AND PRECIPITATOR BUILDING CLEANING | PARA. 6 - ROUTINE HOUSEKEEPING AND PLANT UPKEEP ACTIVITIES |
| PARTS WASHER SOLVENT AND OTHER CLEANING SOLVENTS | PARA. 6 - ROUTINE HOUSEKEEPING AND PLANT UPKEEP ACTIVITIES |
| BUILDING VENTILATING SYSTEMS | PARA. 5 - SYSTEMS NOT DESIGNED TO REMOVE AIR POLLUTANTS FROM EQUIPMENT |
| PETROLEUM STORAGE TANKS:<br>2 - 2000 GAL. NO. 2 FUEL OIL TANKS<br>1 - 1000 GAL.UNLEADED GASOLINE TANK<br>1 - 275 GAL. NO. 2 FUEL OIL TANK<br>1 - 265 GAL. NO. 2 FUEL OIL TANK<br>6 - TURBINE OIL STORAGE TANKS - LARGEST TANK 10,000 GAL.<br>527,940 GAL. NO. 2 FUEL OIL TANK | PARA. 7 - UNITS WITH A POTENTIAL TO EMIT TWO TONS OR LESS PER YEAR - NOTE: THE POTENTIAL TO EMIT FOR BIG STONE'S LARGEST TANK, THE 527,,940 GAL. STORAGE TANK , IS 0.51 TONS PER YEAR. CONSEQUENTLY, THESE TANKS FALL WELL UNDER THE TWO-TON LIMIT. (SEE FOLLOWING DATA) |
| COAL AND ASH SPILL CLEANUP | PARA. 6 - ROUTINE HOUSEKEEPING AND PLANT UPKEEP ACTIVITIES |
| PORTABLE PUMP, WELDERS OR OTHER DEVICES POWERED BY INTERNAL COMBUSTION ENGINES | PARA. 4 - HEAT INPUT OF NOT MORE THAN 3,500,000 BTU (25 GAL. OF NO. 2 FUEL OIL) PER HOUR AND PARA. 6 - ROUTINE HOUSEKEEPING AND PLANT UPKEEP ACTIVITIES |
| ALTERNATIVE FUEL HANDLING | BECAUSE ALTERNATIVE FUELS ARE NOT APT TO GENERATE AIR EMISSIONS, IT IS UNLIKELY THAT HANDLING ACTIVITIES WILL PRODUCE 2 TONS OR MORE PER YEAR OF EMISSIONS |

| | |
|---|---|
| PORTABLE FUEL-FIRED HEATERS | PARA. 4 - HEAT INPUT OF NOT MORE THAN 3,500,000 BTU (25 GAL. OF NO. 2 FUEL OIL) PER HOUR |

BIG STONE PLANT
STORAGE TANK EMISSIONS
527,940 GALLON STORAGE TANK
ESTIMATED POTENTIAL VOC EMISSIONS

ESTIMATE BASED ON AIRS AND A TOTAL FUEL BURN RATE FOR AUXILLIARY BOILER, HEATING BOILER, AND EMERGENCY DIESEL GENERATOR

| TYPE OF LOSS | AIRS SCC NO. | EMISSION RATE (LBS) | UNIT OF MEASURE | NUMBER OF UNITS (GAL.) | TONS VOC PER YEAR |
|---|---|---|---|---|---|
| BREATHING LOSS | 4-03-010-19 | 0.39 | PER 1000 GAL. STORAGE | 527,940 | 0.10 |
| FILLING LOSS | 4-03-012-06 | 0.022 | PER 1000 GAL. OF THROUGHPUT | 20,367,000 | 0.20 |
| WORKING LOSS | 4-03-010-21 | 0.02 | PER 1000 GAL. OF THROUGHPUT | 20,367,000 | 0.20 |
| TOTAL | | | | | 0.51 |

# BIG STONE PLANT

## FUEL-FIRED EMISSION SOURCES

**1999**

| PERMIT ID NUMBER | DESCRIPTION | FUEL TYPE | FUEL USE TONS or GALS | BTU/LB OR GAL | TOTAL MMBTU | % SULFUR AS REC | PARTICULATE TONS PER YR | SO2 TONS PER YR | NOX TONS PER YEAR |
|---|---|---|---|---|---|---|---|---|---|
| 001 | BIG STONE #1 | | | | 41,746,673 MMBTU | | 618 TONS/YR | 2669.4 TONS/YR | 23336.4 TONS/YR |
| | TOTAL (CEMS) | COAL | | | | | 74.7 LBS/HR | 1.2 LBS/MMBTU | |
| | EMISSION RATE | | | | | | | | |
| 002 | AUX BOILER | FUEL OIL | 87,087 GALLONS | 140,000 | 12,192.2 MMBTU | 0.45 | 0.1 TONS/YR | 2.8 TONS/YR | 0.9 TONS/YR |
| | EMISSION RATE | | | | | | 2.3 LBS/HR | 0.5 LBS/MMBTU | |
| 003 | HEATING BOILER | FUEL OIL | 40 GALLONS | 140,000 | 5.6 MMBTU | 0.45 | 0.000 TONS/YR | 0.00 TONS/YR | 0.00 TONS/YR |
| | EMISSION RATE | | | | | | 1.1 LBS/HR | 0.5 LBS/MMBTU | |
| 004 | EMERGENCY DIESEL GENERATOR | | 612 GALLONS | 140,000 | 85.7 MMBTU | 0.45 | 0.003 TONS/YR | 0.02 TONS/YR | 0.13 TONS/YR |
| | | | | | | | 0.3 LBS/HR | 0.456 LBS/MMBTU | |

**FORMULAS**

**PARTICULATE**

SOLID FUELS
MMBTU * 0.015 LBS/MMBTU/2000 LBS/TON = TONS PARTICULATE

Heating Boiler/ Oil
GALS/FUEL * 2 LB PER 1,000 GALS / 1000 / 2000 LBS/TON = TONS PARTICULATE

Emer. Diesel Gen
MMBtu * 0.0697 LB/MMBtu / 2000 LBS/TON = TONS PARTICULATE

**SO2**

SOLID FUELS — CEMS DATA

Heating Boiler/ Oil
GALS/FUEL * 142 * %s (I.E. 0.40) PER 1,000 GALS/ 1000 / 2000 LB/TON = TONS SO2

Emer. Diesel Gen
MMBtu * 1.01 LB/ MMBtu * % S / 2000 LBS/TON = TONS SO2

**NOX**

SOLID FUELS — CEMS DATA

Heating Boiler/ Oil
GALS/FUEL * 20 LB PER 1,000 GALS/1000 / 2000 LB/TON = TONS NOX

Emer. Diesel Gen
MMBtu * 3.1 LB/MMBtu / 2000 LB/TON = TONS NOX

**OPERATING HOURS**

BIG STONE #1 — 8381

AUX BOILER
gals/fuel * 140,000 Btu/gal * 10 -6 / 210 MMBtu/hr / 0.75 (% load) = — 77.4

HTG BOILER
gals/fuel * 140,000 Btu/gal * 10 -6 / 98 MMBtu/hr / 0.75 (% load) = — 0.1

EMERGENCY DIESEL GENERATOR — 18.2

Prepared by: Beverly Rund — February 4, 2000

# BIG STONE PLANT
# PROCESS EMISSION SOURCES

## 1999

| DESCRIPTION | INLET AIR FLOW (CFM) | EST. EMISSION AT 0.02 GR/CF* (LB/HR) | MAX. DESIGN CAPACITY (TONS/HR) | TONS PROCESSED | HOURS OF OPERATION ** | ANNUAL OPERATING FACTOR | TONS PART. PER YR. |
|---|---|---|---|---|---|---|---|
| LIVE COAL STORAGE BUILDING TRANSFER POINT | 8,300 | 1.42 | 3,000 | 2,210,101 | 829 | 1 | 0.59 |
| ROTARY CAR DUMPER | 12,000 | 2.06 | 3,000 | 2,210,101 | 829 | 1 | 0.85 |
| ROTARY CAR DUMPER BUILDING | 122,000 | 20.92 | 3,000 | 2,210,101 | 829 | 1 | 8.67 |
| FUEL TRANSFER HOUSE | 15,650 | 2.68 | 1,100 | 2,126,838 | 8381 | 1 | 11.25 |
| NORTH FUEL CONVEYING SYSTEM AND SILO | 14,200 | 2.44 | 550 | 1,063,419 | 8381 | 1 | 10.20 |
| SOUTH FUEL CONVEYING SYSTEM, SILO VENTS, AND PLANT DISTRIB. BIN | 16,500 | 2.83 | 1,100 | 2,126,838 | 8381 | 1 | 11.86 |
| FLY ASH SILO | 4310 | 0.74 | 19 | 48,856 | 8760 | 1 | 3.24 |
| TOTAL | | | | | | | 46.66 |

*Grain loading estimated on the basis of the design criteria for the fuel transfer house collector. Actual emissions for other fabric filter sources may differ.

**Note: Several emissions control units continue to operate even though the materials handling activity is not occurring.

BIG STONE PLANT
MATERIALS HANDLING EMISSIONS SOURCES
ESTIMATED 1999 CONTROLLED FUGITIVE EMISSIONS

FROM AP-42, 11.2.3-3 FOR MATERIAL DROP AND TRANSFER ACTIVITIES
FORMULA: E = k *0.0032 * ((U/5)^1.3 / (M/2)^1.40)*#/T
WHERE : k (PARTICLE SIZE MULTIPLIER = 1
U (MEAN WIND SPEED, MPH) = 11.2 (30-YEAR AVG. ABERDEEN, SD)
M (MOISTURE CONTENT, %) = 4.5 (AP-42)
E = 0.0029 #/TON
The following source emissions are calculated based on the above formula corrected for the estimated source collection efficiency as noted.

| SOURCE | EST. COLL. EFF. | PART EMISSION #/TON | TONS PROCESSED | TONS PART. PER YEAR |
|---|---|---|---|---|
| LIVE FUEL STORAGE BLDG. TRANSFER POINT | 0.90 | 0.00029 | 2,210,101 | 0.32 |
| LIVE STORAGE BLDG. | 0.90 | 0.00029 | 2,210,101 | 0.32 |
| ROTARY CAR DUMPER CONVEYOR | 0.90 | 0.00029 | 2,210,101 | 0.32 |
| ROTARY CAR DUMPER BUILDING | 0.75 | 0.000725 | 2,210,101 | 0.80 |
| FUEL TRANSFER HOUSE | 0.90 | 0.00029 | 2,126,838 | 0.31 |
| NORTH FUEL CONVEYING SYSTEM | 0.98 | 5.8E-05 | 1,063,419 | 0.03 |
| SOUTH FUEL CONVEYING SYSTEM AND PLT. DISTRIBUTION BIN | 0.98 | 5.8E-05 | 2,126,838 | 0.06 |
| FLY ASH SILO | 0.95 | 0.000145 | 56,217 | 0.00 |
| TOTAL | | | | 2.17 |

**BIG STONE PLANT**
**ESTIMATED FUGITIVE EMISSIONS**
**1999**

| SOURCE | | SCC NO. | PM EMIS. RATE | PM10 EMIS. RATE | UNIT OF MEASURE | SOURCE RATE | NUMBER OF UNITS | TONS PM/YR | TONS PM10/YR |
|---|---|---|---|---|---|---|---|---|---|
| Coal Stockpile | Open storage pile - coal | 3-05-010-43 | NA | 17,060 | lbs/acre | Est. 5 acres | 5 | --- | 42.65 |
| Reclaiming Coal from Stockpile: Dozing | Buldozing coal (50%) | 3-05-010-46* | 49.4 | NA | lbs/hr dozing | 5000 tons/day | 146.08 | 3.61 | 2.71 |
| Reclaiming Coal from Stockpile: Scraper | Scraper - remove coal from SP and bottom dump into live storage (50%) | 3-05-010-41 | 0.066 | 0.01 | lb/ton | 182,596.16 tons from SP * 50% scraper/2000 lb/ton | 91,298.08 | 3.01 | 0.46 |
| Replenish Coal Pile: Load into scraper | Truck loading - Coal | 3-05-010-38 | 0.04 | 0.005 | lb/ton loaded | 189,270.47 tons to SP *25 % scraper | 47,317.62 | 0.95 | 0.12 |
| Replenishing Coal Pile: Coal Transfer - scraper | Truck unloading bottom dump - coal (25% time) | 3-05-010-41 | 0.066 | 0.01 | lb/ton | 189,270.47 tons to SP *25 % scraper | 47,317.62 | 1.56 | 0.24 |
| Replenishing Coal Pile: Dozing | Buldozing coal (75% time) | 3-05-010-46* | 49.4 | NA | lbs/hr dozing | 189,270.47 tons to SP /5000 tons dozed /day * 8 hr/day*.75 | 0.11 | 0.00 | --- |
| Coal Conveying: Used Coal Crushing for Est. | Crushing - coal | 3-05-010-10 | 0.02 | 0.006 | lbs/ton | Tons of coal burned | 2,038,402.46 | 20.38 | 6.12 |
| Loading Fly Ash into Scraper | Cement unloading - storage bins | 3-05-011-07 | 0.24 | 0.14 | lbs/ton | | 56,217.34 | 6.75 | 3.94 |
| Unloading Fly Ash from Scraper | Raw Mat.unload (cement mfg - dry) | 3-05-006-07 | NA | 0.1 | lb/ton unloaded | 56,217.34 tons fly ash | 56,217.34 | --- | 0.28 |
| Loading Bottom Ash into Scraper | Bulk Loading - const. Sand & gravel | 3-05-025-06 | 0.02 | 0.0024 | lb/ton | 101,279.05*.002(or 0.0024) lb/ton /2000 | 93,452.24 | 0.93 | 0.11 |
| Scraper Travel Mode | Scraper travel mode - coal | 3-05-010-31** | 14.6 | NA | lb/vehicle mile | 1 mile each trip of 25 tons | 5,986.78 | 43.70 | 10.93 |
| Ash Disposal Site | Open storage pile - coal | 3-05-010-43 | NA | 17,060 | lbs/acre | 4.75 acres | 4.75 | | 40.52 |
| Ash Disposal Site Reclamation | Overburden replace. - coal mining | 3-05-010-48 | 0.012 | 0.006 | lbs/ton overburden | 4.5 acres, 2' clay, 0.5 ft top soil | 23,268.30 | 0.14 | 0.07 |
| | | | | | | | | PM | PM10 |
| | | | | | | | Total 1999 Tons | **81.04** | **108.13** |

*PM10 emissions using a conversion factor of 0.75 based on EPA's AP-42, 11.9-5, 7/98 - Table 11.9-1
**PM10 emissions using a conversion factor of 0.25 based on EPA's AP-42, 13.2.2-3, 9/98 - Equation 1

## BIG STONE PLANT

### FUEL-FIRED EMISSION SOURCES

**2000**

| PERMIT ID NUMBER | DESCRIPTION | FUEL TYPE | FUEL USE TONS or GALS | BTU/LB OR GAL | TOTAL MMBTU | % SULFUR AS REC | PARTICULATE (assume all PM10) TONS PER YR | SO2 TONS PER YR | NOX TONS PER YEAR | CO TONS PER YEAR |
|---|---|---|---|---|---|---|---|---|---|---|
| 001 | BIG STONE #1 | | 2,130,636 TONS COAL | | 40,236,712 MMBTU | | 302 TONS/YR | 13,528 TONS/YR | 16,899 TONS/YR | 533 Tons/Yr from Coal |
| | TOTAL (CEMS) | COAL | | | | | | | | |
| | | FUEL OIL | 115,144 GALLONS | | | | | | | 0.3 Tons/Yr from Oil |
| | EMISSION RATE | | | | | | 73.3 LBS/HR | 0.7 LBS/MMBTU | | |
| 002 | AUX BOILER | FUEL OIL | 122,841 GALLONS | 140,000 | 17,197.7 MMBTU | 0.45 | 0.1 TONS/YR | 3.9 TONS/YR | 1.2 TONS/YR | 0.3 TONS/YR |
| | EMISSION RATE | | | | | | 2.3 LBS/HR | 0.5 LBS/MMBTU | | |
| 003 | HEATING BOILER | FUEL OIL | 0 GALLONS | 140,000 | 0 MMBTU | 0.45 | 0.000 TONS/YR | 0.00 TONS/YR | 0.00 TONS/YR | 0.00 TONS/YR |
| | EMISSION RATE | | | | | | #DIV/0! LBS/HR | #DIV/0! LBS/MMBTU | | |
| 004 | EMERGENCY DIESEL GENERATOR | | 759 GALLONS | 140,000 | 106.3 MMBTU | 0.45 | 0.004 TONS/YR | 0.02 TONS/YR | 0.16 TONS/YR | 0.00 TONS/YR |
| | | | | | | | 0.4 LBS/HR | 0.5 LBS/MMBTU | | |

**FORMULAS**

**PARTICULATE**

**SOLID FUELS**

MMBTU * 0.015 LBS/MMBTU/2000 LBS/TON = TONS PARTICULATE

**Heating Boiler/ Oil**

GALS/FUEL * 2 LB PER 1,000 GALS / 1000 / 2000 LBS/TON = TONS PARTICULATE

**Emer. Diesel Gen**

MMBtu * 0.0697 LB/MMBtu / 2000 LBS/TON = TONS PARTICULATE

**SO2**

**SOLID FUELS** CEMS DATA

**Heating Boiler/ Oil**

GALS/FUEL * 142 * %s (I.E. 0.40) PER 1,000 GALS/ 1000 / 2000 LB/TON = TONS SO2

**Emer. Diesel Gen**

MMBtu * 1.01 LB/ MMBtu * % S / 2000 LBS/TON = TONS SO2

**NOX**

**SOLID FUELS** CEMS DATA - 0.84 lb/MM Btu in 2000

**Heating Boiler/ Oil**

GALS/FUEL * 20 LB PER 1,000 GALS/1000 / 2000 LB/TON = TONS NOX

**Emer. Diesel Gen**

MMBtu * 3.1 LB/MMBtu / 2000 LB/TON = TONS NOX

**CO**

**SOLID FUELS** 0.6 LBS/TONS OF FUEL

**DISTILLATE OIL** 5 LBS/1000 GAL OF FUEL

**OPERATING HOURS**

| | |
|---|---|
| BIG STONE #1 | 8229.7 |
| AUX BOILER gals/fuel * 140,000 Btu/gal * 10 -6 / 210 MMBtu/hr / 0.75 (% load) = | 109.2 |
| HTG BOILER gals/fuel * 140,000 Btu/gal * 10 -6 / 98 MMBtu/hr / 0.75 (% load) = | 0.0 |
| EMERGENCY DIESEL GENERATOR | 19.6 |

Prepared by: Beverly Rund February 22, 2001

BIG STONE PLANT
PROCESS EMISSIONS SOURCES

2000

| DESCRIPTION | INLET AIR FLOW (CFM) | EST. EMISSION AT 0.02 GR/CF* (LB/HR) | MAX. DESIGN CAPACITY (TONS/HR) | TONS PROCESSED | HOURS OF OPERATION * | ANNUAL OPERATING FACTOR | TONS PART. PER YR. |
|---|---|---|---|---|---|---|---|
| LIVE COAL STORAGE BUILDING TRANSFER POINT | 8,300 | 1.42 | 3,000 | 2,166,553 | 861 | 1 | 0.61 |
| ROTARY CAR DUMPER CONVEYOR | 12,000 | 2.06 | 3,000 | 2,166,553 | 861 | 1 | 0.89 |
| ROTARY CAR DUMPER BUILDING | 122,000 | 20.92 | 3,000 | 2,166,553 | 861 | 1 | 9.01 |
| FUEL TRANSFER HOUSE | 15,650 | 2.68 | 1,100 | 2,191,517 | 8230 | 1 | 11.04 |
| NORTH FUEL CONVEYING SYSTEM AND SILO VENTS | 14,200 | 2.44 | 550 | 1,095,758 | 8230 | 1 | 10.02 |
| SOUTH FUEL CONVEYING SYSTEM, SILO VENTS, AND PLANT DISTRIB. BIN | 16,500 | 2.83 | 1,100 | 2,191,517 | 8230 | 1 | 11.64 |
| FLY ASH SILO | 4310 | 0.74 | 19 | 41,443 | 8784 | 1 | 3.25 |
| TOTAL | | | | | | | 46.46 |

*Grain loading estimated on the basis of the design criteria for the fuel transfer house collector. Actual emissions for other fabric filter sources may differ.

**Note: Several emissions control units continue to operate even though the materials handling activity is not occurring.

BIG STONE PLANT

**AIR EMISSIONS**

**2000**

| | | |
|---|---|---|
| Heat Rate from CEMS | 40,236,712.0 | Million Btu |
| Particulate Emission Rate | 0.15 | Lbs/ Million Btu |
| Tons of coal burned | 2,130,536 | Tons Burned |
| % Ash - Dry Basis | 7.62 | Dry Basis % ash |

| | | AP-42[1] | | EPRI Emission Factors [2,3] | | | | |
|---|---|---|---|---|---|---|---|---|
| CAS number | Parameter | Coal Emission Factor [1] (lbs/ton) | Pounds Emitted | Coal Emission Factor[2] (lbs/trillion Btu) | Element Analysis Dry Basis | Lbs/ Million Btu | | |
| 75070 | Acetaldehyde | | | 3.2000 | | 0.0000032 | 128.76 | pounds |
| 98862 | Acetophenone | | | 1.2000 | | 0.0000012 | 48.28 | pounds |
| 107028 | Acrolein | | | 1.9000 | | 0.0000019 | 76.45 | pounds |
| 71432 | Benzene | | | 3.9000 | | 0.0000039 | 156.92 | pounds |
| 100447 | Benzyl chloride | | | 0.2800 | | 0.00000028 | 11.27 | pounds |
| 92524 | Biphenyl | | | 0.1600 | | 0.00000016 | 6.44 | pounds |
| 117817 | Bis(2-ethylhexyl)phthalate (DEHP) | | | 3.6000 | | 0.0000036 | 144.85 | pounds |
| 75252 | Bromoform | 3.90E-05 | 83.09 | | | | | pounds |
| 75150 | Carbon disulfide | | | 1.1000 | | 0.0000011 | 44.26 | pounds |
| 108907 | Chlorobenzene | | | 0.1600 | | 0.00000016 | 6.44 | pounds |
| 67663 | Chloroform | | | 0.5500 | | 0.00000055 | 22.13 | pounds |
| 13113 | Dimethly phthalate | | | 0.0900 | | 0.00000009 | 3.62 | pounds |
| 77781 | Dimethyl sulfate | 4.80E-05 | 102.27 | | | | | pounds |
| 121142 | 2,4-Dinitrotoluene | | | 0.2000 | | 0.0000002 | 8.05 | pounds |
| 100414 | Ethyl benzene | | | 0.8000 | | 0.0000008 | 32.19 | pounds |
| 75003 | Ethyl chloride (Chlorothane) | 4.20E-05 | 89.48 | | | | | pounds |
| 106934 | Ethylene dibromide (Dibromoethane) | 1.20E-06 | 2.56 | | | | | pounds |
| 107062 | Ethylene dichloride (1,2-Dichlorothane) | 4.00E-05 | 85.22 | | | | | pounds |
| 50000 | Formaldehyde | | | 2.6000 | | 0.0000026 | 104.62 | pounds |
| 110543 | Hexane | 6.70E-05 | 142.75 | | | | | pounds |
| 7647010 | Hydrochloric acid | | | 600.1 | | 0.000600143 | 24147.76 | pounds |
| 7664393 | Hydrogen fluoride (Hydrofluoric Acid) | | | 2743.7 | | 0.002743733 | 110398.80 | pounds |
| 78591 | Isophorone | | | 1.2000 | | 0.0000012 | 48.28 | pounds |
| 74893 | Methyl bromide (Bromomethane) | 1.60E-04 | 340.89 | | | | | pounds |
| 74873 | Methyl chloride (Chloromethane) | 5.30E-04 | 1129.18 | | | | | pounds |
| 71556 | Methly Chloroform (1,1,1-Trichloroethane) | | | 0.6100 | | 0.00000061 | 24.54 | pounds |
| 78933 | Methyl ethyl ketone (2-Butanone) | 3.90E-04 | 830.91 | | | | | pounds |
| 60344 | Methyl hydrazine | 1.70E-04 | 362.19 | | | | | pounds |
| 80626 | Methyl methacrylate | | | 1.1000 | | 0.0000011 | 44.26 | pounds |
| 75092 | Methylene chloride (Dichloromethane) | | | 3.6000 | | 0.0000036 | 144.85 | pounds |
| 91203 | Napthalene | | | 0.6200 | | 0.00000062 | 24.95 | pounds |
| 108952 | Phenol | | | 3.3000 | | 0.0000033 | 132.78 | pounds |
| 123386 | Propionaldehyde | | | 1.8000 | | 0.0000018 | 72.43 | pounds |
| 100425 | Styrene | | | 0.7000 | | 0.0000007 | 28.17 | pounds |
| 1746016 | 2,3,7,8-Tetrachlorodibenzo-p-dioxin | | | 0.000002 | | 0.000000000002 | 0.00 | pounds |
| 127184 | Tetrachloroethylene (Perchloroethylene) | | | 0.4200 | | 0.00000042 | 16.90 | pounds |
| 108883 | Toluene | | | 1.7000 | | 0.0000017 | 68.40 | pounds |
| 120821 | 1,2,4-Trichlorbenzene | | | 1.5000 | | 0.0000015 | 60.36 | pounds |
| 108054 | Vinyl acetate | | | 0.3100 | | 0.00000031 | 12.47 | pounds |
| 75014 | Vinyl chloride | | | 0.7300 | | 0.00000073 | 29.37 | pounds |

BIG STONE PLANT

**AIR EMISSIONS**

**2000**

| | | |
|---|---|---|
| Heat Rate from CEMS | 40,236,712.0 | Million Btu |
| Particulate Emission Rate | 0.15 | Lbs/ Million Btu |
| Tons of coal burned | 2,130,536 | Tons Burned |
| % Ash - Dry Basis | 7.62 | Dry Basis % ash |

| CAS number | Parameter | AP-42[1] Coal Emission Factor [1] (lbs/ton) | AP-42[1] Pounds Emitted | EPRI Emission Factors [2, 3] Coal Emission Factor[2] (lbs/trillion Btu) | Element Analysis Dry Basis | Lbs/ Million Btu | | |
|---|---|---|---|---|---|---|---|---|
| | Polynuclear Aromatic Hydrocarbons (PAH) combined | 2.08E-05 | 44.23 | | | | | |
| | Antimony Compound[3] | | | $(0.92)X^{0.63}$ | <1 | 0.00000004 | 1.43 | pounds |
| | Arsenic Compound (including arsine) | | | $(3.1)X^{0.85}$ | <1.44 | 0.00000005 | 2.11 | pounds |
| | Beryllium Compound | | | $(1.2)X^{1.1}$ | <0.27 | 0.000000001 | 0.04 | pounds |
| | Cadmium Compound | | | $(3.3)X^{0.5}$ | <0.21 | 0.000000114 | 4.60 | pounds |
| | Chromium Compound | | | $(3.7)X^{0.58}$ | 6.06 | 0.000000786 | 31.64 | pounds |
| | Cobalt Compound | | | $(1.7)X^{0.69}$ | <2.31 | 0.000000086 | 3.45 | pounds |
| | Lead | | | $(3.4)X^{0.80}$ | <3.44 | 0.000000147 | 5.90 | pounds |
| | Manganese Compound | | | $(3.8)X^{0.60}$ | 23.31 | 0.000001718 | 69.12 | pounds |
| | Mercury Compound | | | 20% reduction[4] | 0.07 | | 238.62 | pounds |
| | Nickel Compound | | | $(4.4)X^{0.48}$ | <1.44 | 0.000001327 | 53.38 | pounds |
| | Polycyclic Organic Matter (4) | | | | | | 0.00 | pounds |
| | Selenium Compound | | | 3% | <1.2 | | 0.00004 | pounds |
| | Total Non-Methane Organic Carbons (TNMOC) | 1.10E-01 | 234,358.96 | | | | | |

| | |
|---|---|
| Total pounds | 374,030.60 pounds |
| Total tons | 187.02 tons |

[1] AP-42 Emission Factors

[2] Emission Factor Estimates from EPRI Study of Power Plant Emissions, TR-105611, November 1995. These formulas are also listed in Table 1.1-16 of AP-42, page 1.1-37, 9/98.

[3] EPRI Formulas where X= Coal ash ppm/ash fraction * PM and "not detected" trace element values will use 1/2 the detection limit.

[4] Energy & Environment Research Center recommend that units equipped with electrostatic precipitators assume 20% reduction in emissions. This is a higher figure than the AP-42 calculation.

BIG STONE PLANT
MATERIALS HANDLING EMISSIONS SOURCES
2000 CONTROLLED FUGITIVE EMISSIONS

FROM AP-42, 11.2.3-3 FOR MATERIAL DROP AND TRANSFER ACTIVITIES
FORMULA: E = k *0.0032 * ((U/5)^1.3 / (M/2)^1.40)*#/T
WHERE : k (PARTICLE SIZE MULTIPLIER = 1
U (MEAN WIND SPEED, MPH) = 11.2 (30-YEAR AVG. ABERDEEN, SD)
M (MOISTURE CONTENT, %) = 4.5 (AP-42)
E = 0.0029 #/TON
The following source emissions are calculated based on the above formula corrected for the estimated source collection efficiency as noted.

| SOURCE | EST. COLL. EFF. | PART EMISSION #/TON | TONS PROCESSED | TONS PART. PER YEAR |
|---|---|---|---|---|
| LIVE FUEL STORAGE BLDG. TRANSFER POINT | 0.90 | 0.00029 | 2,166,553 | 0.31 |
| LIVE STORAGE BLDG. VENTS | 0.90 | 0.00029 | 2,166,553 | 0.31 |
| ROTARY CAR DUMPER CONVEYOR | 0.90 | 0.00029 | 2,166,553 | 0.31 |
| ROTARY CAR DUMPER BUILDING | 0.75 | 0.000725 | 2,166,553 | 0.79 |
| FUEL TRANSFER HOUSE | 0.90 | 0.00029 | 2,191,517 | 0.32 |
| NORTH FUEL CONVEYING SYSTEM | 0.98 | 5.8E-05 | 1,095,758 | 0.03 |
| SOUTH FUEL CONVEYING SYSTEM AND PLT. DISTRIBUTION BIN | 0.98 | 5.8E-05 | 2,191,517 | 0.06 |
| FLY ASH SILO | 0.95 | 0.000145 | 41,443 | 0.00 |
| TOTAL | | | | 2.14 |

**BIG STONE PLANT**
**ESTIMATED FUGITIVE EMISSIONS**
**2000**

| SOURCE | | SCC NO. | PM EMIS. RATE | PM10 EMIS. RATE | UNIT OF MEASURE | SOURCE RATE | NUMBER OF UNITS | TONS PM/YR | TONS PM10/YR |
|---|---|---|---|---|---|---|---|---|---|
| Coal Stockpile | Open storage pile - coal | 3-05-010-43 | NA | 17,060 | lbs/acre | Est. 5 acres | 5 | ---- | 42.65 |
| Reclaiming Coal from Stockpile: Dozing | Buldozing coal (50%) | 3-05-010-46* | 49.4 | NA | lbs/hr dozing | Tons from SP / 4800 tons/ 8 hr. day* 50% dozing | 128.25 | 3.17 | 2.38 |
| Reclaiming Coal from Stockpile: Scraper | from SP and bottom dump into live storage (50%) | 3-05-010-41 | 0.066 | 0.01 | lb/ton | Tons from SP * 50% scraper | 76,952.00 | 2.54 | 0.38 |
| Replenish Coal Pile: Load into scraper | Truck loading - Coal (25%) | 3-05-010-38 | 0.04 | 0.005 | lb/ton loaded | Tons to SP *25 % scraper | 14,595.48 | 0.29 | 0.04 |
| Replenishing Coal Pile: Coal Transfer - scraper | Truck unloading bottom dump - coal (25% time) | 3-05-010-41 | 0.066 | 0.01 | lb/ton | Tons to SP *25 % scraper | 14,595.48 | 0.48 | 0.07 |
| Replenishing Coal Pile: Dozing | Buldozing coal (75% time) | 3-05-010-46* | 49.4 | NA | lbs/hr dozing | Tons to SP /5000 tons dozed /day * 8 hr/day* 75 % | 70.06 | 1.73 | 1.3 |
| Coal Conveying: Used Coal Crushing for Est. | Crushing - coal | 3-05-010-10 | 0.02 | 0.006 | lbs/ton | Tons of coal burned for year | 2,130,536 | 21.31 | 6.39 |
| Loading Fly Ash into Scraper | Cement unloading - storage bins | 3-05-011-07 | 0.24 | 0.14 | lbs/ton | Tons fly ash landfilled | 26,734.88 | 3.21 | 1.87 |
| Unloading Fly Ash from Scraper | Raw Mat.unload (cement mfg - dry) | 3-05-006-07 | NA | 0.1 | lb/ton unloaded | Tons fly ash landfilled | 26,734.88 | ---- | 1.34 |
| Loading Bottom Ash into Scraper | Bulk Loading - const. Sand & gravel | 3-05-025-06 | 0.02 | 0.0024 | lb/ton | Tons bottom ash landfilled | 58,062.62 | 0.58 | 0.07 |
| Scraper Travel Mode | Scraper travel mode - coal | 3-05-010-31** | 14.6 | NA | lb/vehicle mile | Tons of ash landfilled / 25 tons per load per mile | 3,391.90 | 24.76 | 6.19 |
| Ash Disposal Site | Open storage pile - coal | 3-05-010-43 | NA | 17,060 | lbs/acre | 4.75 acres | 4.75 | ---- | 40.52 |
| Ash Disposal Site Reclamation | Overburden replace. - coal mining | 3-05-010-48 | 0.012 | 0.006 | lbs/ton overburden | No Closure in 2000 | 0 | 0 | 0 |
| | | | | | | | | PM | PM10 |
| | | | | | | | Total Tons | **58.07** | **103.20** |

*PM10 emissions using a conversion factor of 0.75 based on EPA's AP-42, 11.9-5, 7/98 - Table 11.9-1
**PM10 emissions using a conversion factor of 0.25 based on EPA's AP-42, 13.2.2-3, 9/98 - Equation 1

## BIG STONE PLANT

FUEL-FIRED EMISSION SOURCES

**Potential to Emit**

| PERMIT ID NUMBER | DESCRIPTION | FUEL TYPE | FUEL USE TONS or GALS | BTU/LB OR GAL | TOTAL MMBTU | % SULFUR AS REC | PARTICULATE (assume all PM10) TONS PER YR | SO2 TONS PER YR | NOX TONS PER YEAR | CO TONS PER YEAR |
|---|---|---|---|---|---|---|---|---|---|---|
| 001 | BIG STONE #1 | | 2,270,000 TONS COAL | 8800 | 39,952,000 MMBTU | 0.5 | 300 TONS/YR | 19,863 TONS/YR | 17,179 TONS/YR | 568 Tons/Yr from Coal |
| | TOTAL (CEMS) | COAL | | | | | | | | |
| | | FUEL OIL | 0 GALLONS | | | | | | | 0.0 Tons/Yr from Oil |
| | EMISSION RATE | | | | | | 68.4 LBS/HR | 1.0 LBS/MMBTU | | |
| 002 | AUX BOILER | FUEL OIL | 13,140,000 GALLONS | 140,000 | 1,839,600.0 MMBTU | 0.45 | 13.1 TONS/YR | 419.8 TONS/YR | 131.4 TONS/YR | 32.9 TONS/YR |
| | EMISSION RATE | | | | | | 3.0 LBS/HR | 0.5 LBS/MMBTU | | |
| 003 | HEATING BOILER | FUEL OIL | 6,132,000 GALLONS | 140,000 | 858,480 MMBTU | 0.45 | 6.132 TONS/YR | 195.92 TONS/YR | 61.32 TONS/YR | 15.33 TONS/YR |
| | EMISSION RATE | | | | | | 1.4 LBS/HR | 0.5 LBS/MMBTU | | |
| 004 | EMERGENCY DIESEL GENERATOR | | 531,732 GALLONS | 140,000 | 74,442.5 MMBTU | 0.45 | 2.694 TONS/YR | 16.92 TONS/YR | 115.39 TONS/YR | 1.33 TONS/YR |
| | | | | | | | 0.6 LBS/HR | 0.5 LBS/MMBTU | | |

**FORMULAS**

**PARTICULATE**

SOLID FUELS

MMBTU * 0.015 LBS/MMBTU/2000 LBS/TON = TONS PARTICULATE

Heating Boiler/ Oil

GALS/FUEL * 2 LB PER 1,000 GALS / 1000 / 2000 LBS/TON = TONS PARTICULATE

Emer. Diesel Gen

MMBtu * 0.0697 LB/MMBtu / 2000 LBS/TON = TONS PARTICULATE

**SO2**

SOLID FUELS 35S(i.e. 0.50) * tons of coal/2000 lb/ton= TONS SO2

Heating Boiler/ Oil

GALS/FUEL * 142 * %S (i.e. 0.40) PER 1,000 GALS/ 1000 / 2000 LB/TON = TONS SO2

Emer. Diesel Gen

MMBtu * 1.01 LB/ MMBtu * % S / 2000 LBS/TON = TONS SO2

**NOX**

SOLID FUELS Permit limit of 0.86 lb/MM Btu

Heating Boiler/ Oil

GALS/FUEL * 20 LB PER 1,000 GALS/1000 / 2000 LB/TON = TONS NOX

Emer. Diesel Gen

MMBtu * 3.1 LB/MMBtu / 2000 LB/TON = TONS NOX

**CO**

SOLID FUELS 0.5 LBS/TONS OF FUEL

DISTILLATE OIL 5 LBS/1000 GAL OF FUEL

**OPERATING HOURS**

| | |
|---|---|
| BIG STONE #1 | 8760 |
| AUX BOILER 210 MMBtu/hr | 8760 |
| HTG BOILER 98 MMBtu/hr | 8760 |
| EMERGENCY DIESEL GENERATOR rated at 60.7 gal/hr | 8760 |

Prepared by: Beverly Rund May 17, 2001

BIG STONE PLANT

**AIR EMISSIONS**

**Potential to Emit**

| | | |
|---|---|---|
| Heat Rate from CEMS | 39,952,000 | Million Btu |
| Particulate Emission Rate | 0.15 | Lbs/ Million Btu |
| Tons of coal burned | 2,270,000 | Tons Burned |
| % Moisture | 29.9 | Percent |
| % Ash - Dry Basis | 7.85 | Dry Basis % ash |

| | | AP-42[1] | | EPRI Emission Factors [2,3] | | | | |
|---|---|---|---|---|---|---|---|---|
| CAS number | Parameter | Coal Emission Factor [1] (lbs/ton) | Pounds Emitted | Coal Emission Factor[2] (lbs/trillion Btu) | Element Analysis Dry Basis | Lbs/ Million Btu | | |
| 75070 | Acetaldehyde | | | 3.2000 | | 0.0000032 | 127.85 | pounds |
| 98862 | Acetophenone | | | 1.2000 | | 0.0000012 | 47.94 | pounds |
| 107028 | Acrolein | | | 1.9000 | | 0.0000019 | 75.91 | pounds |
| 71432 | Benzene | | | 3.9000 | | 0.0000039 | 155.81 | pounds |
| 100447 | Benzyl chloride | | | 0.2800 | | 0.00000028 | 11.19 | pounds |
| 92524 | Biphenyl | | | 0.1600 | | 0.00000016 | 6.39 | pounds |
| 117817 | Bis(2-ethylhexyl)phthalate (DEHP) | | | 3.6000 | | 0.0000036 | 143.83 | pounds |
| 75252 | Bromoform | 3.90E-05 | 88.53 | | | | | pounds |
| 75150 | Carbon disulfide | | | 1.1000 | | 0.0000011 | 43.95 | pounds |
| 108907 | Chlorobenzene | | | 0.1600 | | 0.00000016 | 6.39 | pounds |
| 67663 | Chloroform | | | 0.5500 | | 0.00000055 | 21.97 | pounds |
| 13113 | Dimethly phthalate | | | 0.0900 | | 0.00000009 | 3.60 | pounds |
| 77781 | Dimethyl sulfate | 4.80E-05 | 108.96 | | | | | pounds |
| 121142 | 2,4-Dinitrotoluene | | | 0.2000 | | 0.0000002 | 7.99 | pounds |
| 100414 | Ethyl benzene | | | 0.8000 | | 0.0000008 | 31.96 | pounds |
| 75003 | Ethyl chloride (Chlorothane) | 4.20E-05 | 95.34 | | | | | pounds |
| 106934 | Ethylene dibromide (Dibromoethane) | 1.20E-06 | 2.72 | | | | | pounds |
| 107062 | Ethylene dichloride (1,2-Dichlorothane) | 4.00E-05 | 90.80 | | | | | pounds |
| 50000 | Formaldehyde | | | 2.6000 | | 0.0000026 | 103.88 | pounds |
| 110543 | Hexane | 6.70E-05 | 152.09 | | | | | pounds |
| 7647010 | Hydrochloric acid | | | 600.1 | | 0.000600143 | 23976.89 | pounds |
| 7664393 | Hydrogen fluoride (Hydrofluoric Acid) | | | 2743.7 | | 0.002743733 | 109617.63 | pounds |
| 78591 | Isophorone | | | 1.2000 | | 0.0000012 | 47.94 | pounds |
| 74893 | Methyl bromide (Bromomethane) | 1.60E-04 | 363.20 | | | | | pounds |
| 74873 | Methyl chloride (Chloromethane) | 5.30E-04 | 1203.10 | | | | | pounds |
| 71556 | Methly Chloroform (1,1,1-Trichloroethane) | | | 0.6100 | | 0.00000061 | 24.37 | pounds |
| 78933 | Methyl ethyl ketone (2-Butanone) | 3.90E-04 | 885.30 | | | | | pounds |
| 60344 | Methyl hydrazine | 1.70E-04 | 385.90 | | | | | pounds |
| 80626 | Methyl methacrylate | | | 1.1000 | | 0.0000011 | 43.95 | pounds |
| 75092 | Methylene chloride (Dichloromethane) | | | 3.6000 | | 0.0000036 | 143.83 | pounds |
| 91203 | Napthalene | | | 0.6200 | | 0.00000062 | 24.77 | pounds |
| 108952 | Phenol | | | 3.3000 | | 0.0000033 | 131.84 | pounds |
| 123386 | Propionaldehyde | | | 1.8000 | | 0.0000018 | 71.91 | pounds |
| 100425 | Styrene | | | 0.7000 | | 0.0000007 | 27.97 | pounds |
| 1746016 | 2,3,7,8-Tetrachlorodibenzo-p-dioxin | | | 0.000002 | | 0.000000000002 | 0.00 | pounds |
| 127184 | Tetrachloroethylene (Perchloroethylene) | | | 0.4200 | | 0.00000042 | 16.78 | pounds |
| 108883 | Toluene | | | 1.7000 | | 0.0000017 | 67.92 | pounds |
| 120821 | 1,2,4-Trichlorbenzene | | | 1.5000 | | 0.0000015 | 59.93 | pounds |
| 108054 | Vinyl acetate | | | 0.3100 | | 0.00000031 | 12.39 | pounds |
| 75014 | Vinyl chloride | | | 0.7300 | | 0.00000073 | 29.16 | pounds |

BIG STONE PLANT

**AIR EMISSIONS**

**Potential to Emit**

| | | |
|---|---|---|
| Heat Rate from CEMS | 39,952,000 | **Million Btu** |
| Particulate Emission Rate | 0.15 | **Lbs/ Million Btu** |
| Tons of coal burned | 2,270,000 | **Tons Burned** |
| % Moisture | 29.9 | **Percent** |
| % Ash - Dry Basis | 7.85 | **Dry Basis % ash** |

| | | AP-42[1] | | EPRI Emission Factors [2, 3] | | | | |
|---|---|---|---|---|---|---|---|---|
| CAS number | Parameter | Coal Emission Factor [1] (lbs/ton) | Pounds Emitted | Coal Emission Factor[2] (lbs/trillion Btu) | Element Analysis Dry Basis | Lbs/ Million Btu | | |
| | Polynuclear Aromatic Hydrocarbons (PAH) combined | 2.08E-05 | 47.12 | | | | | |
| | Antimony Compound[3] | | | $(0.92)X^{0.63}$ | <1 | 0.00000004 | 1.45 | pounds |
| | Arsenic Compound (including arsine) | | | $(3.1)X^{0.85}$ | <1.44 | 0.00000005 | 2.15 | pounds |
| | Beryllium Compound | | | $(1.2)X^{1.1}$ | <0.27 | 0.000000001 | 0.04 | pounds |
| | Cadmium Compound | | | $(3.3)X^{0.5}$ | <0.21 | 0.000000116 | 4.63 | pounds |
| | Chromium Compound | | | $(3.7)X^{0.58}$ | 6.06 | 0.000000800 | 31.96 | pounds |
| | Cobalt Compound | | | $(1.7)X^{0.69}$ | <2.31 | 0.000000088 | 3.50 | pounds |
| | Lead | | | $(3.4)X^{0.80}$ | <3.44 | 0.000000150 | 6.00 | pounds |
| | Manganese Compound | | | $(3.8)X^{0.60}$ | 23.31 | 0.000001749 | 69.87 | pounds |
| | Mercury Compound | | | 20% reduction[4] | 0.07 | | 254.24 | pounds |
| | Nickel Compound | | | $(4.4)X^{0.48}$ | <1.44 | 0.000001346 | 53.76 | pounds |
| | Polycyclic Organic Matter (4) | | | | | | 0.00 | pounds |
| | Selenium Compound | | | 3% | <1.2 | | 0.00004 | pounds |
| | Total Non-Methane Organic Carbons (TNMOC) | 1.10E-01 | 249,700.00 | | | | | |

| | |
|---|---|
| Total pounds | 388,636.59 pounds |
| Total tons | 194.32 tons |

[1] AP-42 Emission Factors

[2] Emission Factor Estimates from EPRI Study of Power Plant Emissions, TR-105611, November 1995. These formulas are also listed in Table 1.1-16 of AP-42, page 1.1-37, 9/98.

[3] EPRI Formulas where X= Coal ash ppm/ash fraction * PM and "not detected" trace element values will use 1/2 the detection limit.

[4] Energy & Environment Research Center recommend that units equipped with electrostatic precipitators assume 20% reduction in emissions. This is a higher figure than the AP-42 calculation.

BIG STONE PLANT
MATERIALS HANDLING EMISSIONS SOURCES
ESTIMATED POTENTIAL CONTROLLED POINT-SOURCE EMISSIONS

| DESCRIPTION | INLET AIR FLOW (CFM) | EST. EMISSION AT 0.02 GR/CF* (LB/HR) | MAX. DESIGN CAPACITY (TONS/HR) | TONS PROCESSED | HOURS OF OPERATION | ANNUAL OPERATING FACTOR | TONS PART. PER YR. |
|---|---|---|---|---|---|---|---|
| LIVE COAL STORAGE BUILDING TRANSFER POINT | 8,300 | 1.42 | 3,000 | 2,270,000 | 1115 | 1 | 0.79 |
| ROTARY CAR DUMPER CONVEYOR | 12,000 | 2.06 | 3,000 | 2,270,000 | 1115 | 1 | 1.15 |
| ROTARY CAR DUMPER BUILDING | 122,000 | 20.92 | 3,000 | 2,270,000 | 1115 | 1 | 11.66 |
| FUEL TRANSFER HOUSE | 15,650 | 2.68 | 1,100 | 2,270,000 | 8760 | 1 | 11.75 |
| NORTH FUEL CONVEYING SYSTEM AND SILO VENTS | 14,200 | 2.44 | 550 | 1,135,000 | 8760 | 1 | 10.67 |
| SOUTH FUEL CONVEYING SYSTEM, SILO VENTS, AND PLANT DISTRIB. BIN | 16,500 | 2.83 | 1,100 | 2,270,000 | 8760 | 1 | 12.39 |
| FLY ASH SILO | 4310 | 0.74 | 19 | 62,000 | 8760 | 1 | 3.24 |
| LIME STORAGE SILO | 1500 | 0.26 | 30 | 262,800 | 8760 | 1 | 1.13 |
| TOTAL | | | | | | | 51.65 |

*Grain loading estimated on the basis of the design criteria for the fuel transfer house collector. Actual emissions for other fabric filter sources may differ.

BIG STONE PLANT
MATERIALS HANDLING EMISSIONS SOURCES
ESTIMATED POTENTIAL CONTROLLED FUGITIVE EMISSIONS

FROM A-42, 11.2.3-3 FOR MATERIAL DROP AND TRANSFER ACTIVITIES
FORMULA: E = k *0.0032 * ((U/5)^1.3 / (M/2)^1.40)*#/T
WHERE : k (PARTICLE SIZE MULTIPLIER = 1
U (MEAN WIND SPEED, MPH) = 11.2 (30-YEAR AVG. ABERDEEN, SD)
M (MOISTURE CONTENT, %) = 4.5 (AP-42)
E = 0.0029 #/TON
The following source emissions are calculated based on the above formula corrected for the estimated source collection efficiency as noted.

| SOURCE | EST. COLL. EFF. | PART EMISSION #/TON | TONS PROCESSED | TONS PART. PER YEAR |
|---|---|---|---|---|
| LIVE FUEL STORAGE BLDG. TRANSFER POINT | 0.90 | 0.00029 | 2,270,000 | 0.33 |
| LIVE SORAGE BLDG. VENTS | 0.90 | 0.00029 | 2,270,000 | 0.33 |
| ROTARY CAR DUMPER CONVEYOR | 0.90 | 0.00029 | 2,270,000 | 0.33 |
| ROTARY CAR DUMPER BUILDING | 0.75 | 0.000725 | 2,270,000 | 0.82 |
| FUEL TRANSFER HOUSE | 0.90 | 0.00029 | 2,270,000 | 0.33 |
| NORTH FUEL CONVEYING SYSTEM | 0.98 | 5.8E-05 | 1,135,000 | 0.03 |
| SOUTH FUEL CONVEYING SYSTEM AND PLT. DISTRIBUTION BIN | 0.98 | 5.8E-05 | 2,270,000 | 0.07 |
| FLY ASH SILO | 0.95 | 0.000145 | 62,000 | 0.00 |
| LIME STORAGE SILO | 0.98 | 5.8E-05 | 262,800 | 0.01 |
| TOTAL | | | | 2.24 |

## BOILER, TURBINE, OR FURNACE OPERATION

1. Facility identification (i.e., Unit #1, Boiler #1, etc.): Big Stone Plant - Unit # 1

2. Manufacturer: Babcock & Wilcox Company

   Purchase date: 1975 Model number:

3. Check one: Stationary X Portable

4. Type (i.e., steam boiler, gas turbine, generator, furnace, etc.): Balanced draft, cyclone-fired steam generator

5. Manufacturer's specifications:

   Maximum design operating rate: 4560* million Btus per hour

   Maximum design capacity pertains to (please circle one): (heat input) or heat output

   Manufacturer's designed operating efficiency: 81.63 %

6. Actual or anticipated operation:

   Primary and secondary fuel, fuel consumption, and fuel parameters:

| Description | Primary Fuel | Secondary Fuel |
|---|---|---|
| Fuel Type **(i.e., natural gas, #2 fuel oil, lignite coal, etc.)** | (See attached pages) | |
| Fuel Consumption **(i.e., cubic feet/year, gallons/year, pound/year, tons/year, etc.)** | (See attached pages) | |
| Hours of Operation **(hours per year)** | Up to 8760 | |
| Heating value **(i.e., Btus/cubic feet, Btus/gallon, Btus/pound, etc.)** | (See attached pages) | |
| Sulfur Content (Wt. %) | (See attached pages) | |
| Ash Content (Wt. %) | (See attached pages) | |

*Design value only, actual heat input to boiler exceeds design – Current maximum heat input as recorded by the CEMS during a Uniform Rating of Generating Equipment test was 5609 mmBtu/hr

8. Has a stack test been conducted? Yes X No

If a stack test(s) has been conducted, please attach a copy of the most recent stack test report to this application and skip item #9. If the Department already has a copy of the most recent stack test, please specify the date of the most recent stack test:

Date of most recent stack test: particulate – April 29, 1999
RATA Test April 24, 2001

9. Stack information (if a stack is present):

Stack height (feet): 498 feet Stack diameter (feet): 24.1667 feet

10. Type of air pollution control equipment: Electrostatic precipitator*
(Examples: wet scrubber, cyclone, baghouse, electrostatic precipitator, etc.)

*Note in addition to the electrostatic precipitator, which is a post-combustion pollution control device, the boiler is equipped with an over-fire air system for NOx emissions reduction.

**Please complete the appropriate air pollution control equipment data sheet(s) for this unit.**

BIG STONE PLANT
PART 70 OPERATING APPLICATION
ESTIMATED ANNUAL FUEL USE

The following is a description of fuels that are currently approved for use, or proposed for use, in the Big Stone Plant unit 1 boiler. The total potential annual amount of fuel used is the Btu equivalent of 2,270,000 tons of subbituminous coal, based on a boiler heat input of 4560 mmBtu per hour and a fuel Btu content of 8800 Btu per pound. The proportion of each fuel used will be based on availability, cost, and applicable permit limitations. The total amount of fuel used will be contingent on actual plant operations.

The following is our estimate of Big Stone's projected annual fuel use:

| FUEL | EST. ANNUAL CONSUMP. | APPROX. HEATING VALUE (BTU/LB) | % SULFUR | % ASH |
|---|---|---|---|---|
| SUBBITUM. COAL | 2,000,000 TONS/YR | 8100 - 8800 | 0.3-0.5% | 4-8% |
| LIGNITE | 0 | | | |
| AG CROP RESIDUE & WASTE SEEDS | 20,000 TONS/YR | 7300 | 0.16 | 1.3% |
| DIST. OIL | 100,000 GAL./YR | 19,200 | <0.50% | |
| MODEF (<50 PPM PCB) | 400,000 GAL/YR | 19,200 | <0.50% | |
| TIRE-DERIVED FUEL | 45,000 TONS/YR | 13,600 | 1.5% | 12.5% |
| REFUSE DERIVED FUEL | 0.00 TONS/YR | 6975 | 0.2% | |
| WASTE TONER POWDER | 10 TONS/YR | 16,900 | 0.1% | |
| TREES & NATURAL WOOD | 400 TONS/YR | | | |
| ON-SITE GEN. USED OIL AND SOLVENTS | EST. 5,000 GAL/YR | EST. 19,400 | | |
| TOSHIBA PLASTIC CHIPS | 1 TON/YR | 17,600 | 0.02% | 0.33% |

| FUEL | EST. ANNUAL CONSUMP. | APPROX. HEATING VALUE (BTU/LB) | % SULFUR | % ASH |
|---|---|---|---|---|
| METAL RECOVERY INC. | 0 TONS/YR | 18,000 | EST. 0.2% | 13.0% |
| GASKET AND "O" RING PRODUCTION WASTE | 0 TONS/YR | | | |
| MANUF. WOOD WASTE CONTAINING FORMALDEHYDE RESINS AND MATERIALS | 0 TONS/YR | | | |
| WCCO BELTING | 0 TONS/YR | 16,800 | 2.08% | 1.74% |
| BFI TUBE FORMS | 0 TONS/YR | | | |
| PETROLEUM COKE | 70,000 TONS PER YR | 14,200 | 5.5% | 0.5% |
| ON-SITE GENERATED USED OIL FILTERS | < ONE TON PER YR. | EST. 5000 | | |
| NON-DETECTABLE PCB OIL (<2 PPM PCB | | | | |
| CHIPPED WOOD TREATED WITH COPPER ARSENATE AND PENTACHLOROPHENOL (NON-HASARDOUS WASTE & METAL CONCEN.<LESS THAN COAL | 0 TONS/YR | | | |

In addition to the above fuels, Big Stone Plant wishes to include provisions in the permit to grant approval for disposal of a number of wastes. All wastes are included in the current permit.

| MATERIAL FOR DISPOSAL | APPROX. AMOUNT |
|---|---|
| BOILER STEAM-SIDE CLEANING WASTE | 100,000 TO 200,000 GALLONS |
| MODEF (50 TO 500 PPM PCB) | UP TO 500,000 GAL/YR |
| OILY FLOOR DRY & DIATOM. EARTH (<50 PPM PCB) | EST. <100 TONS/YR |
| DIRT, DEBRIS, SORBENTS (<50 PPM PCB) | EST. <10 TON PER YEAR |
| EVAPORATE BRINE CONCENTATOR SUPERNATANT AT RATE UP TO 130 GPM | |

The dirt, debris, and sorbents contaminated with oil containing <50 ppm PCB originates from oil handing activities, including spills. Disposal of this material has become difficult and expensive with the closing of many landfills. Big Stone Plant offers an environmentally sound disposal alternative for this waste stream.

The boiler steam-side cleaning waste originates from chemically cleaning the interior of the boiler tubes using a chelating agent, most commonly a material containing ethlylenediaminetetraacetecic acid (EDTA). One of the methods of disposal is collecting waste in tanks at the conclusion of the cleaning, and then incinerating the waste once the boiler returns to operation.

The waste would also contain any metals removed from the boiler. There is a possibility that the waste would contain metals in sufficient concentration so that the waste fails the TCLP test for hazardous waste. In that event, the waste could either be treated to remove the metal prior to incineration or treated off site. Attached is a portion of an Electric Power Research Institute report on the subject. Note that the evaporation of the waste is conducted at a rate of 10 gpm per every 100,000 pounds per hour of steam flow. This waste stream is estimated to total 100,000 to 200,000 gallons. It is generated once every 5 to 8 years.

BSP/TITLEV2001/FUEL

## ELECTROSTATIC PRECIPITATOR DATA SHEET

**Facility name:** Big Stone Plant

**Facility Location:** Big Stone City, SD

**Emission Unit(s) served by this electrostatic precipitator (please list all units):**

1. 1975 Babcock & Wilcox Balanced Draft, Cyclone-Fired Steam Generator
2. 
3. 

**Manufacturer Information:**

Manufacturer: Wheelabrator-Frye

Manufacturer date: 1975 Installation date: 1975

Type of electrostatic precipitator (please check one): Cold X Hot

Number of fields: 4

Voltage range: 480 (primary) 65,300 (secondary)

**Facility Operation and Maintenance:**

Describe maintenance of electrostatic precipitator (visual equipment inspection, inspection schedule, etc.):

Annual visual inspects and response to equipment failure alarms

How do you intend to monitor the operation of this electrostatic precipitator (primary and secondary current, primary and secondary voltage, sparking rate, number of fields on line)?

Emissions are monitored via a continuous opacity monitor. Troubleshooting equipment is used during equipment failure or as the process dictates.

**MISCELLANEOUS CONTROLS**
**DATA SHEET**

**Facility name:** Big Stone Plant

**Facility location:** Big Stone City, SD

**Please describe control equipment or technique:** Over-fire air system for reduction of NOx emissions

**Emission unit(s) served by this control equipment or technique (please list all units):**

1. 1975 Babcock & Wilcox Balanced Draft, Cyclone-Fired Steam Generator
2. _____
3. _____

**Manufacturer information (if applicable):**

Manufacturer: Not Applicable

Manufacturer date: N/A Installation date: 10/22/97
(Operational 01/01/2000)

**Facility operation and maintenance (please complete applicable information):**

Pressure drop: _____ inches $H_2O$ (normal) _____ inches $H_2O$ (maximum)

Inlet Temperature: _____ ℉ (minimum) _____ ℉ (maximum)

Outlet Temperature: _____ ℉ (minimum) _____ ℉ (maximum)

Inlet air flow rate: _____

Other (please specify): System operated to maintain NOx emissions at 0.86 lb/mmBtu or less based on an annual average.

Describe maintenance of control equipment or technique (visual inspections, inspection schedule, how often cleaned, how often equipment or material is changed , etc.):

The control system in integral to the combustion process. The equipment is inspected during scheduled maintenance outages.

How do you intend to monitor the operation of this control equipment or technique (pressure drop, visual inspection, outlet temperature, flow rates, etc.)?

The effectiveness of the control equipment is monitored by the NOx and CO2 continuous emissions monitor.

**MISCELLANEOUS CONTROLS**
**DATA SHEET**

**Facility name:** Big Stone Plant

**Facility location:** Big Stone City, SD

**Please describe control equipment or technique:** Humidification/Flue Gas Conditioning System

**Emission unit(s) served by this control equipment or technique (please list all units):**

1. 1975 Babcock & Wilcox Balanced Draft, Cyclone-Fired Steam Generator
2. _____
3. _____

**Manufacturer information (if applicable):**

Manufacturer: Envirocare

Manufacturer date: 1996 Installation date: Humidification System - 1996
Flue Gas Conditioning Added in 1999

**Facility operation and maintenance (please complete applicable information):**

Pressure drop: _____ inches $H_2O$ (normal) _____ inches $H_2O$ (maximum)

Inlet Temperature: _____ ℉ (minimum) _____ ℉ (maximum)

Outlet Temperature: _____ ℉ (minimum) _____ ℉ (maximum)

Inlet air flow rate: _____

Other (please specify): The system is operated as an aid for opacity and particulate emissions control by helping to limit opacity emissions to less than 20%.

Describe maintenance of control equipment or technique (visual inspections, inspection schedule, how often cleaned, how often equipment or material is changed , etc.):

Humidification lances are cleaned as ash buildup dictates. Visual inspection of equipment during normal plant operator inspections.

How do you intend to monitor the operation of this control equipment or technique (pressure drop, visual inspection, outlet temperature, flow rates, etc.)?

The system operation effectiveness is monitored by the continuous opacity monitoring system and system control points.

## BOILER, TURBINE, OR FURNACE OPERATION

1. Facility identification (i.e., Unit #1, Boiler #1, etc.): Big Stone Plant - Auxiliary Boiler

2. Manufacturer: Combustion Engineering

   Purchase date: 1973 Model number: 31-A-14

3. Check one: Stationary X Portable

4. Type (i.e., steam boiler, gas turbine, generator, furnace, etc.): Steam boiler

5. Manufacturer's specifications:

   Maximum design operating rate: 210* million Btus per hour
   Or (150,000# steam/hour)
   Maximum design capacity pertains to (please circle one): (heat input) or heat output

   Manufacturer's designed operating efficiency: 80.29 %
   Mfr predicted performance

6. Actual or anticipated operation: Used to provide steam to the steam driven equipment during start-up of the unit #1 boiler

Primary and secondary fuel, fuel consumption, and fuel parameters:

| Description | Primary Fuel | Secondary Fuel |
|---|---|---|
| Fuel Type **(i.e., natural gas, #2 fuel oil, lignite coal, etc.)** | # 2 fuel oil/non detectable PCB oil | |
| Fuel Consumption **(i.e., cubic feet/year, gallons/year, pound/year, tons/year, etc.)** | 100,000 gal/yr | |
| Hours of Operation **(hours per year)** | 90 hours @ average of 75% load | |
| Heating value **(i.e., Btus/cubic feet, Btus/gallon, Btus/pound, etc.)** | 140,000 Btu/gal | |
| Sulfur Content (Wt.%) | <0.5% | |
| Ash Content (Wt.%) | | |

*Design value only, actual heat input to boiler may exceed design

8. Has a stack test been conducted? Yes _____ No X

If a stack test(s) has been conducted, please attach a copy of the most recent stack test report to this application and skip item #9. If the Department already has a copy of the most recent stack test, please specify the date of the most recent stack test:

Date of most recent stack test:

9. Stack information (if a stack is present):

Stack height (feet): 85 feet Stack diameter (feet): 6.5 feet

10. Type of air pollution control equipment: None
(Examples: wet scrubber, cyclone, baghouse, electrostatic precipitator, etc.)

**Please complete the appropriate air pollution control equipment data sheet(s) for this unit.**

EPRI
Electric Power
Research Institute

Keywords:
Boiler chemical cleaning waste
Waste management
Recycling
Waste utilization
Waste disposal
Pollution control

EPRI TR-101095
Project 2215-01
Final Report
August 1992

# Boiler Chemical Cleaning Waste Management Manual

Prepared by
Radian Corporation
Austin, Texas

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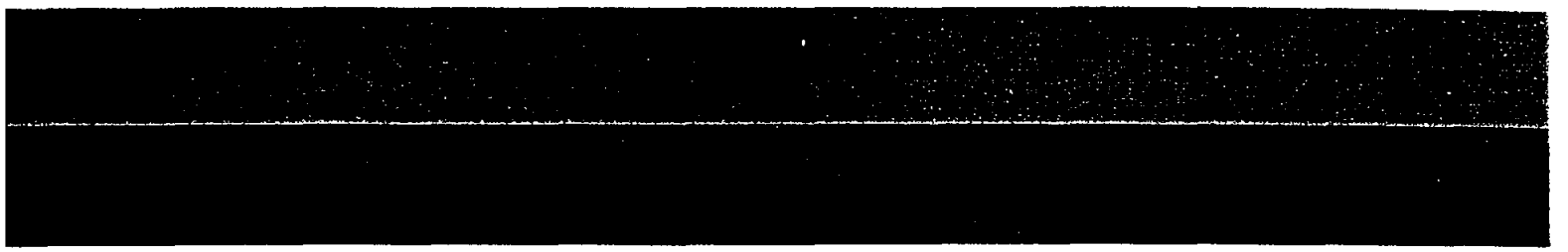

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# Boiler Chemical Cleaning Waste Management Manual

Boiler chemical cleaning wastes pose potentially difficult waste management problems for utilities. This manual presents a number of different strategies for managing these wastes during water-side cleaning of utility boilers.

**INTEREST CATEGORIES**

Waste and water management
Land and water quality—chemistry and physics
Waste disposal and use

**KEYWORDS**

Boiler chemical cleaning waste
Waste management
Recycling
Waste utilization
Waste disposal
Pollution control

**BACKGROUND** Over time, the internal surfaces of boiler tubes collect mineral deposits. These deposits interfere with heat transfer from the hot combustion gases to the water and steam inside the tubes, reducing boiler efficiency. Utilities typically clean these tube interior surfaces every two to five years. The type of cleaner used depends on the types of deposits, boiler type and tube metallurgy, relative cost, and previous boiler cleaning experience. Previous EPRI work found that boiler chemical cleaning wastes (BCCWs) can contain high concentrations of heavy metals as well as inorganic and organic compounds not commonly present in other power plant liquid effluents (EPRI report CS-5281). Some of these wastes are difficult to treat to required water quality discharge limits, and some are classified as hazardous under the Resource Conservation and Recovery Act. This manual expands on the previous EPRI study by examining several waste management options.

**OBJECTIVES** To describe the chemical composition and regulatory status of boiler chemical cleaning wastes; to summarize boiler chemical cleaning waste management options.

**APPROACH** Researchers used existing literature and past EPRI reports to determine the chemical makeup of the wastes. They then investigated the regulatory status of the various components and identified several management options. For each option, the research team prepared a technology description, along with an evaluation of the effectiveness of the option and its cost. The researchers used actual field data in the effectiveness and cost evaluations whenever possible; in some cases, they used laboratory or literature data.

**RESULTS** Laboratory screening tests showed that permanganate treatment or natural degradation in ash ponds followed by sulfide addition are effective methods for removing metals from citric acid wastes. No chemical treatment method tested was suitable for EDTA (ethylenediamine tetracetic acid)-based cleaning wastes.

Emissions-monitoring studies were conducted at two utilities that routinely evaporate wastes, an often-used practice. Emissions of metal compounds from the cleaning wastes at a coal-fired boiler were found to be insignificant compared with the normal plant emissions. At an oil-fired generating unit, about 50 percent of the metals contained in the waste could not be accounted for. (Further investigation will be required to clear up this anomaly.) No significant changes in normal operating conditions were observed at either generating plant during evaporation.

Laboratory studies of BCCW reuse in a bench-scale flue gas desulfurization system showed that five types of waste could be successfully recycled as a supplement for makeup water. The chemistry of the scrubbing solution results in precipitation of the metals, which are subsequently removed with scrubber sludge. Toxicity Characteristic Leaching Procedure tests on the sludge did not show any of the metals to be leachable.

**EPRI PERSPECTIVE** Successful management of boiler chemical cleaning wastes requires a knowledge of the regulatory requirements and the technical options available. From a pollution-prevention point of view, options that minimize waste production— such as source reduction, substitution, or recycling—are preferred. These options include reduced cleaning frequency (through improved boiler-cycle chemistry); decreasing the volume of chemicals used; and changing cleaning chemicals to less-corrosive, less-toxic, or more-easily-treatable compounds. EPRI's *Manual on Chemical Cleaning of Fossil-Fueled Steam Generation Equipment* (report CS-3289) is a good source of information on cleaning frequency and procedures. (A revised version of this document is expected to be published by the end of 1992.)

This report is one in a series created to help utilities manage low-volume and noncombustion waste streams. EPRI report CS-5281 discusses treatment options and costs for 10 waste streams. EPRI report GS-7052 describes management schemes for 16 wastes. Risk management for BCCW and other noncombustion wastes is being investigated under EPRI research project RP2575. An extensive pollution prevention project (RP3006) is underway to assist utilities in establishing cost-effective waste management programs.

**PROJECT**
RP2215-01
Project Managers: Tom Lott; Wayne Micheletti; and Michael Miller
Environment Division
Contractor: Radian Corporation

For further information on EPRI research programs, call
EPRI Technical Information Specialists (415) 855-2411.

Section 8

# EVAPORATION IN BOILER

Evaporation of nonhazardous boiler chemical cleaning wastes by direct injection into the firebox of a boiler is a promising option for disposal of these wastes. This technique has been used with all types of boiler cleaning wastes, but is especially attractive for use with organic-based cleaning solutions, which are more difficult to treat chemically. Evaporation of the organic-based solutions vaporizes the aqueous fraction and destroys the organic cleaning agent. While the organic compounds contribute some heat value, their combustion is overshadowed by the energy required for the evaporation of the water in the solution. The fate of the metal components present in the BCCW depends on the type and composition of the boiler fuel, the type and location of the injection nozzle(s), and the control device(s) downstream of the boiler. Results of BCCW evaporation tests and mass balance considerations suggest that evaporation of organic-based BCCW is not a significant environmental concern and does not adversely affect plant operations.

## TECHNOLOGY DESCRIPTION

Typically, the BCCW and rinse waters are drained to a holding tank from which the solution is pumped through one or more nozzles into the firebox of an operating boiler. Equipment required for evaporation of BCCW includes a storage tank, a pump, piping and a nozzle for injection into the boiler. A typical evaporation rate of 10 gpm per 100,000 pounds per hour of steam flow may require a period of 1-4 days for the evaporation of the wastes generated in a single boiler cleaning episode. The volume required for storage of wastes prior to evaporation may range from 50,000 to 200,000 gallons, depending on boiler size and the number of rinses mixed with the cleaning solution prior to evaporation. This volume may be provided by a dedicated storage tank or by tankage rented for a short period during boiler cleaning episodes.

Evaporation of BCCW requires that the boiler used be equipped with a suitable atomizing nozzle. This may require the retrofit of a nozzle if an existing boiler nozzle is not appropriate. Nozzles used for atomizing boiler cleaning wastes in a boiler must be capable of withstanding the combined effects of high temperature and the corrosivity of the cleaning wastes.

## TREATMENT EFFECTIVENESS

To evaluate this BCCW disposal approach, evaporation of an EDTA-based waste at a coal-fired plant and of an ammoniated citric acid waste at a split-fired oil/gas plant were monitored. These studies and other reports on BCCW evaporation (1) found no significant operational or environmental problems with evaporation of such wastes.

### Test Descriptions

The study of waste evaporation in a coal-fired plant involved a 200-megawatt (MW) unit in the southeastern region of the United States. The steam side of the Unit 2 boiler tubes at the plant were cleaned with a solution containing ammoniated ethylene diaminetetraacetic acid (EDTA). The resulting boiler chemical cleaning waste was mixed with the first rinse and evaporated in the adjacent Unit 1 boiler.

Unit 1 is a 198 MW front-firing boiler. Design steam flow is 1.45 million pounds per hour, and the design and operating pressures are approximately 2,200 and 2,000 psi, respectively. The main steam and reheat temperatures are both 1005° F at the operating pressure. In 1986, the Unit 1 heat rate averaged 9,682 Btu/kWhr. No control devices are required for flue gas desulfurization.

The boiler cleaning waste was injected through a single nozzle in the center of the firing wall, about 20 feet above the top set of burners. The waste was injected at a rate of 71 to 72 gallons per minute, which corresponds to an evaporation rate of 5-6 gallons per minute per 100,000 pounds per hour of steam produced. Evaporation of the BCCW required about 14 hours to complete.

The EDTA cleaning waste fed to the coal-fired boiler during evaporation testing represented the spent cleaning solution drain plus the first rinse. Although measured aluminum and copper concentrations were higher in the combined solution than in the spent cleaning solution, the concentrations of chromium and lead were diluted to about 80 percent of the RCRA limits by the addition of the rinse water. The composition of the waste evaporated in the coal-fired boiler is shown in Table 8-1.

The evaporation test at an oil/gas-fired plant involved a 240 MW unit in the south central United States. A combined spent ammoniated citric acid cleaning solution and two rinses, with a total volume of approximately 79,200 gallons, containing about 1,635 pounds of iron and 50 pounds of copper, was evaporated. The waste was pumped from a holding pond into the boiler through two nozzles on opposite sides of the boiler at a rate of approximately 25 gallons per minute. The nozzles were

Table 8-1

COMPOSITION OF SPENT EDTA CLEANING SOLUTION AND BCCW EVAPORATED IN COAL-FIRED BOILER

| Elemental Analyses | Concentration (mg/L) Spent Cleaning Solution | Combined Boiler Feed[a] Test 1 | Test 2 |
|---|---|---|---|
| Aluminum | 1.6 | 6.64 | 4.26 |
| Antimony | 0.56 | 0.362 | 0.303 |
| Arsenic | ND[b] | ND | ND |
| Barium | 0.47 | 0.24 | 0.156 |
| Beryllium | ND | ND | ND |
| Cadmium | ND | 0.032 | 0.0215 |
| Calcium | 11 | 5.8 | 3.95 |
| Chromium | 7.6 | 4.25 | 3.09 |
| Cobalt | 1.4 | 0.665 | 0.51 |
| Copper | 1.6 | 50.2 | 48.3 |
| Iron | 5400 | 3410 | 2470 |
| Lead | 1.2 | 0.81 | 0.50 |
| Magnesium | 2.2 | 2.74 | 2.06 |
| Manganese | 38 | 23.7 | 17.4 |
| Mercury | ND | ND | ND |
| Molybdenum | 1 | 1.38 | 1.36 |
| Nickel | 240 | 151.7 | 111.6 |
| Potassium | ND | ND | ND |
| Selenium | ND | ND | ND |
| Silicon | 10 | 4.1 | ND |
| Silver | 0.25 | 0.0285 | 0.026 |
| Sodium | 70 | 45.4 | 28.6 |
| Thallium | 0.39 | 0.304 | 0.235 |
| Vanadium | 1 | 0.241 | 0.2 |
| Zinc | 85 | 54.5 | 37.6 |
| Acidity as ($CaCO_3$) | <1 | <1 | <1 |
| Alkalinity (as $CaCO_3$) | 10000 | 5900 | 4700 |
| Ammonia (as N) | 4600 | 2600 | 1800 |
| Chloride | <50 | NA[c] | NA |
| COD | 15000 | 8500 | 6400 |
| Fluoride | <25 | NA | NA |
| Nitrate | <50 | NA | NA |
| Nitrite | <50 | NA | NA |
| pH (field) | 9.25 | 8.75 | 8.85 |
| Sulfate | <250 | NA | NA |
| TOC | 7600 | 4000 | 3100 |
| TDS | 12600 | 11000 | 5700 |

[a]Spent cleaning solution plus first rinse
[b]ND = Not Detected, below analytical detection limit
[c]NA = Not Analyzed

located about two feet below the lowest level of burners in the boiler. Evaporation tests were conducted during both split-feed oil/gas firing and during firing with gas alone. Because the gas and oil burned at this facility contain minimal amounts of ash and sulfur, no control devices are required for particulate removal or flue gas desulfurization.

The citric acid based BCCW evaporated in the oil/gas-fired boiler contained relatively low concentrations of copper and iron. Other metals were also generally low in concentration with the exception of arsenic, which was present in small quantities. The composition of the citric acid BCCW is shown in Table 8-2.

Results

The following section describes the results of the BCCW evaporation field monitoring programs.

Effects on Total Ash Inputs and Outputs. The sampling program used to evaluate the evaporation of BCCW in a coal-fired boiler is outlined in Table 8-3. The sampling procedures used for monitoring the tests at the oil/gas-fired plant were similar, except that ash samples were not available for analysis. The sampling effort was designed especially to track the distribution through the unit of the trace metals and organics introduced with the BCCW. Boiler operation and performance data were also collected for baseline and evaporation periods to evaluate the impact of waste evaporation on normal plant operations. The results regarding operations data are presented later in this section.

The total amount and the distribution of ash were unchanged during evaporation testing at the coal-fired plant. The average total ash output rate was 12,380 lb/hr during baseline conditions, and 12,420 lb/hr during evaporation testing. The standard deviation in ash content in the coal was 3.7%, or about ± 440 lbs/hr. This deviation is more than three times the average hourly ash contribution of the BCCW. Measurement of the distribution of outlet ash showed that 97% of the total ash reached the electrostatic precipitator during both baseline and evaporation testing and 99 percent of the ash was removed. Bottom ash and economizer ash represented percent and 1 percent of the total ash output, respectively.

Results from evaporation testing during gas and oil/gas firing do show significant increases in particulates during the waste evaporation. The closures on input versus output rates for most elements are quite poor for these tests, however. Inputs were generally measured to be substantially greater than the outputs.

Table 8-2

COMPOSITION OF SPENT AMMONIATED CITRIC ACID BCCW
EVAPORATED IN SPLIT-FEED OIL/GAS-FIRED BOILER

| | Concentration (mg/L) | |
|---|---|---|
| | Feb. 5 | Feb. 9 |
| **Elemental Analyses** | | |
| Aluminum | 0.22 | 1.6 |
| Antimony | ND | ND |
| Arsenic | 0.049 | 0.054 |
| Barium | 0.002 | 0.26 |
| Beryllium | ND | ND |
| Boron | 0.022 | 0.21 |
| Cadmium | 0.001 | 0.002 |
| Calcium | 39 | 50 |
| Chromium | 0.56 | 0.53 |
| Cobalt | ND | 0.008 |
| Copper | 23 | 23 |
| Iron | 420 | 520 |
| Lead | 0.20 | 0.21 |
| Magnesium | 9.9 | 10 |
| Manganese | 3.2 | 3.8 |
| Mercury | ND | ND |
| Molybdenum | ND | ND |
| Nickel | 2.1 | 2.1 |
| Selenium | ND | ND |
| Silicon | 0.54 | 2.5 |
| Silver | ND | ND |
| Sodium | 310 | 360 |
| Thallium | ND | ND |
| Vanadium | 0.009 | ND |
| Zinc | 3.8 | 3.8 |
| Alkalinity (as $CaCO_3$) | 1,700 | 1,700 |
| Ammonia (as N) | 540 | 570 |
| Chloride | 24 | 23 |
| COD | 1,800 | 2,000 |
| Fluoride | 110 | 120 |
| Nitrate | 3.2 | 3.1 |
| pH (units) | 8.5 | 8.2 |
| Sulfate | 10 | 13 |
| TOC | 900 | 950 |
| TDS | 2,800 | 2,800 |
| TSS | 110 | 42 |

[a] ND = Not detected, below analytical detection limit.

Table 8-3

SUMMARY OF SAMPLING AND ANALYTICAL PARAMETERS AND METHODS USED DURING BCCW EVAPORATION TESTING AT A COAL-FIRED POWER PLANT

| Sampling Location | Type of Sample | Sampling Method | Analysis Performed |
|---|---|---|---|
| Coal Feed Bin | Combustion Coal | Grab Sample | Metals Composition, Ultimate and Proximate Analysis |
| BCCW Storage | BCCW Feed to Boiler | Grab Sample | Select Water Quality Parameters, Metals Composition, TCO[a] |
| Lake Water Feed Pump | Inlet Sluice Water | Grab Sample | Select Water Quality Parameters, Metals Composition, TCO |
| Ash Pond | Bottom Ash Solids | Grab Sample | Wt. % Solids, TCLP Leach for RCRA Metals and TCO, Metals Composition, TCO |
| | | Bottom Ash Sluice Liquor | Grab Sample Select Water Quality Parameters, Metals Composition, TCO |
| Economizer Ash Hopper | Economizer Ash | Grab Sample | TCLP Leach for RCRA Metals and TCO, Metals Composition, TCO |

Table 8-3

(Continued)

| Sampling Location | Type of Sample | Sampling Method | Analysis Performed |
|---|---|---|---|
| ESP Inlet | Flue Gas | EPA Method 2 | Flue Gas Flowrate |
| | | EPA Method 3 | Molecular Weight |
| | | EPA Method 4 | Moisture Content |
| | Fly Ash | EPA Method 5 | Grainloading, Metals Composition |
| | | EPA Method 17 | TCLP Leach for RCRA Metals |
| ESP Outlet | Flue Gas | EPA Method 2 | Flue Gas Flowrate |
| | | EPA Method 3 | Molecular Weight |
| | | EPA Method 4 | Moisture Content |
| | | EPA Mod. Method 5 | TCO |
| | | EPA Method 7D | $NO_x$ |
| | | VOST | Volatile Organics |
| | Fly Ash | EPA Method 5 | Grainloading, Metals Composition |

[a]Total Chromatographable Organics (TCO).

indicating that most elements are captured, or partially captured, before leaving the stack. This is plausible, and, in fact, a build-up of ash on the boiler floor after evaporation has been observed by the utility personnel. The particulate mass rates observed leaving the stack during two split-fired evaporation tests were 0.021 and 0.014 lbs/million Btu of heat input. The total amount of ash emitted during these evaporation tests is well below the New Source Performance Standard of 0.030 lb/million Btu of heat input, but the increase in ash output above baseline represents only 31-35 percent of the total mass of additional ash introduced by evaporating the boiler cleaning wastes. If the deposition of ash in the boiler continued at the observed rate during the evaporation of the entire 80,000 gallons of BCCW, the total mass of ash accumulating in the boiler would be approximately 900-1000 pounds. The presence of this ash was not confirmed in the course of this study.

Total Inputs and Outputs of Metals. During the coal-fired evaporation monitoring, complete data on the distribution of metals in output streams were obtained. Most of the elements which were injected into the boiler with the BCCW contributed insignificantly (less than ten percent) to the flux of those elements contained in the coal. The mass rate for a stream was considered to be insignificant if it represented less than ten percent of the total flux for that element. However, the amounts of chromium, copper, iron, nickel, and zinc contained in the injected BCCW did represent significant additions to their respective fluxes during the evaporation.

The contribution of the various inlet and outlet streams to the total mass rate for each of these elements is shown in Table 8-4. The injection of the BCCW increased the measured input of chromium by about 15 percent; copper by over 100 percent; iron by about 12 percent; nickel by over 200 percent; and provided the only measurable input of zinc. With the exception of iron, the sum of all the measured output streams for these five metals did not increase as much during evaporation as the sum of the input streams did. For example, the increase in the sum of the chromium output during evaporation was below the level of significance, and the sum of zinc in all output streams rose by less than a factor of two.

The mass balance closures for these five metals are also presented in Table 8-4, for both baseline and evaporation periods. In most cases, larger amounts of the metals were detected in the outlet streams than were detected entering the boiler, resulting in mass balance closures (inlet/outlet) of less than one. The differences in inlet and outlet mass rates are a result of analytical uncertainty (which increases with decreasing concentration) and the difficulty associated with accurately measuring the flow rates of the coal and fly ash streams.

Table 8-4

DISTRIBUTION OF SELECT METALS IN PROCESS STREAMS
DURING BCCW EVAPORATION IN A COAL-FIRED BOILER

| Process Stream | Average Mass Rate (lb/hr) Chromium | Copper | Iron | Nickel | Zinc |
|---|---|---|---|---|---|
| **Inlet** | | | | | |
| Coal | | | | | |
| Baseline = | 1.07 | 1.79 | 921 | 3.13 | ND[a] |
| Evaporation = | 0.95 | 1.61 | 848 | 2.34 | ND |
| BCCW | | | | | |
| Baseline = | - | - | - | - | - |
| Evaporation - | 0.14 | 1.81 | 108 | 4.84 | 1.69 |
| Lake Water | | | | | |
| Baseline = | ND | ND | 0.002 | ND | ND |
| Evaporation = | ND | ND | 0.003 | ND | ND |
| Totals | | | | | |
| Baseline = | 1.07 | 1.79 | 921 | 3.13 | ND |
| Evaporation = | 1.09 | 3.42 | 956 | 7.18 | 1.69 |
| **Outlet** | | | | | |
| ESP Inlet Ash | | | | | |
| Baseline = | 1.58 | 2.40 | 755 | 3.20 | 1.70 |
| Evaporation = | 1.74 | 3.71 | 1,020 | 6.03 | 2.34 |
| Economizer Ash | | | | | |
| Baseline = | 0.01 | 0.01 | 9.97 | 0.03 | 0.01 |
| Evaporation = | 0.02 | 0.03 | 13.10 | 0.08 | 0.005 |
| Bottom Ash | | | | | |
| Baseline = | 0.02 | 0.02 | 11.89 | 0.06 | ND |
| Evaporation = | 0.02 | 0.03 | 14.30 | 0.08 | 0.01 |
| Sluice Liquor | | | | | |
| Baseline = | ND | ND | 0.01 | ND | ND |
| Evaporation = | ND | ND | 0.03 | ND | ND |
| Totals | | | | | |
| Baseline = | 1.61 | 2.43 | 777 | 3.29 | 1.71 |
| Evaporation = | 1.78 | 3.77 | 1,050 | 6.19 | 2.36 |
| **Closure (inlet/outlet)** | | | | | |
| Baseline = | 0.67 | 0.74 | 1.19 | 0.95 | - |
| Evaporation = | 0.61 | 0.91 | 0.91 | 1.16 | 0.72 |

[a]ND = Not detected, below analytical detection limit.

Inlet and outlet fluxes of metals measured during field monitoring of BCCW evaporation in the oil/gas-fired boiler are shown in Table 8-5. Calcium, copper, iron, sodium and zinc are largely contributed by the chemical cleaning wastes. As mentioned earlier, the mass balance closures for the test results from split-feed oil/gas firing indicated much of the ash from the wastes precipitated within the boiler; consequently, the outlet rates measured for most metals are considerably less than their respective inlet rates.

Process Stream Characteristics. This section discusses the composition and toxicity characteristics of selected individual process streams measured during the BCCW evaporation in the coal-fired boiler.

Bottom Ash. Data analysis using the Students' T test showed no statistically significant increase in the mass rate of any metal or Total Chromatographable Organics (TCO) in the bottom ash during evaporation in the coal-fired boiler. The results from EPA's Toxicity Characteristic Leaching Procedure for the bottom ash are presented in Table 8-6. The concentrations of all RCRA metals are below their toxicity limits. The average concentrations of arsenic, barium, and thallium in ash produced during BCCW evaporation were slightly higher than baseline values, but none of the increases was statistically significant. TCLP extracts were also analyzed for TCO. In all cases the TCO levels were at or below that of the field blank sample.

Economizer Ash. Statistically significant increases in three of the metals added with the BCCW were measured in the economizer ash at the coal-fired plant. Copper, iron, and nickel were present in the economizer ash at increased rates during evaporation. In the TCLP test results for the economizer ash, shown in Table 8-7, cadmium and nickel show increases over baseline values, but only the increase in nickel was statistically significant. (In many cases, one or more of the baseline or evaporation samples was less than the detection limit, which resulted in wide ranges of variability, since a value of zero was assumed for these samples.) The increase in the nickel concentration was probably a direct result of the BCCW evaporation. However, the concentration of nickel in the leachate from the evaporation monitoring samples was still several times lower than the regulatory limits established under California law (nickel is not currently regulated under RCRA). The economizer ash TCLP leachates were also analyzed for TCO; none had a TCO level exceeding that of the field blank.

ESP Inlet Fly Ash. TCLP results for the ESP inlet fly ash at the coal-fired plant are presented in Table 8-8. The average TCLP leachable concentrations of cadmium,

## Table 8-5

## INLET/OUTLET ELEMENTAL MASS RATES DURING BCCW EVAPORATED IN A SPLIT-FEED OIL/GAS-FIRED BOILER[a]

| Date: | Feb. 5 | | Feb. 5 | | Feb. 9 | | Feb. 9 | |
|---|---|---|---|---|---|---|---|---|
| Type of Operation: | Baseline | | Evaporation | | Baseline | | Evaporation | |
| | Inlet Mass Rate | Outlet Mass Rate | Inlet Mass Rate | Outlet Mass Rate | Inlet Mass Rate | Outlet Mass Rate | Inlet Mass Rate | Outlet Mass Rate |
| Element | (lb/hr) | (lb/hr) | (lb/hr) | (lb/hr) | (lb/hr) | (lb/hr) | (lb/hr) | (lb/hr) |
| Aluminum | 1.28 | 0.09 | 1.29 | 0.10 | 0.80 | 0.10 | 0.90 | 0.90 |
| Barium | 0.03 | 0.02 | 0.03 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 |
| Boron | 1.38 | <0.01 | 1.39 | 0.02 | 0.90 | 0.05 | 0.94 | 0.01 |
| Calcium | 0.69 | 0.28 | 1.44 | 0.38 | 0.40 | 0.26 | 1.42 | 0.30 |
| Copper | 0.02 | 0.04 | 0.46 | 0.20 | <0.01 | 0.03 | 0.46 | 0.16 |
| Iron | 0.91 | 3.93 | 8.84 | 3.24 | 0.60 | 1.72 | 10.44 | 2.50 |
| Lead | 0.04 | 0.03 | 0.05 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 |
| Magnesium | 2.40 | 0.61 | 2.60 | 0.67 | 1.60 | 0.46 | 1.83 | 0.52 |
| Manganese | 0.10 | 0.12 | 0.17 | 0.14 | 0.10 | 0.08 | 0.14 | 0.09 |
| Molybdenum | 0.22 | 0.01 | 0.22 | 0.01 | 0.10 | 0.01 | 0.5 | 0.01 |
| Nickel | 1.42 | 0.73 | 1.47 | 0.62 | 0.90 | 0.44 | 1.01 | 0.44 |
| Sodium | 1.28 | 0.67 | 7.18 | 2.59 | 0.80 | 1.18 | 7.73 | 2.91 |
| Vanadium | 2.22 | 0.55 | 2.23 | 0.69 | 1.40 | 0.35 | 1.51 | 0.45 |
| Zinc | 0.19 | 0.23 | 0.26 | 0.29 | 0.10 | 0.18 | 0.20 | 0.31 |

[a]Only elements contributing 0.02 lbs per hour or more to the total elemental mass rate are presented. This is the level of quantitation achievable with the sampling and analysis procedures that were used.

Table 8-6

TCLP RESULTS FOR BOTTOM ASH SAMPLES
COLLECTED DURING BCCW EVAPORATION IN A COAL-FIRED BOILER

| Element | RCRA Limit (mg/L) | Average During Baseline (mg/L) | Standard Deviation (%)[a] | Average During Evaporation (mg/L) | Standard Deviation (%) |
|---|---|---|---|---|---|
| Arsenic | 5 | 0.009 | 24.5 | 0.012 | 6.1 |
| Barium | 100 | 0.538 | 39.0 | 0.870 | 6.5 |
| Cadmium | 1 | ND[b] | | ND | |
| Chromium | 5 | 0.015 | 120 | ND | |
| Lead | 5 | 0.004 | 84.2 | 0.004 | 60.6 |
| Mercury | 0.2 | ND | | ND | |
| Nickel | 20[c] | 0.008 | 200 | ND | |
| Selenium | 1 | ND | | ND | |
| Silver | 5 | 0.016 | 38.2 | ND | |
| Thallium | 7[c] | 0.001 | 200 | 0.002 | 141 |

[a]The standard deviation is expressed as a percent of the average concentration.

[b]ND = Not Detected, below analytical detection limit.

[c]Toxicity threshold limits for nickel and thallium have not been established under RCRA. The given limits for these metals are based on the California Toxicity Criteria and are shown for illustrative purposes only.

Table 8-7

TCLP RESULTS FOR ECONOMIZER ASH SAMPLES
COLLECTED DURING BCCW EVAPORATION IN A COAL-FIRED POWER PLANT

| Element | RCRA Limit (mg/L) | Average During Baseline (mg/L) | Standard Deviation (%)[a] | Average During Evaporation (mg/L) | Standard Deviation (%) |
|---|---|---|---|---|---|
| Arsenic | 5 | 0.140 | 79.6 | 0.014 | 36.7 |
| Barium | 100 | 0.183 | 20.7 | 0.210 | 6.7 |
| Cadmium | 1 | 0.002 | 200 | 0.006 | 12.9 |
| Chromium | 5 | 0.036 | 49.3 | ND[b] | |
| Lead | 5 | 0.010 | 81.6 | 0.004 | 20.2 |
| Mercury | 0.2 | ND | | ND | |
| Nickel | 20[c] | 0.010 | 200 | 1.75 | 12.1 |
| Selenium | 1 | ND | | ND | |
| Silver | 5 | 0.006 | 117 | 0.005 | 141 |
| Thallium | 7[c] | 0.006 | 20.1 | 0.005 | 28.3 |

[a]The standard deviation is expressed as a percent of the average concentration.

[b]ND = Not Detected, below analytical detection limit.

[c]Toxicity threshold limits for nickel and thallium have not been established under RCRA. The given limits for these metals are based on the California Toxicity Criteria and are shown for illustrative purposes only.

Table 8-8

TCLP RESULTS FOR ESP INLET FLY ASH SAMPLES
COLLECTED DURING BCCW EVAPORATION IN A COAL-FIRED POWER PLANT

| Element | RCRA Limit (mg/L) | Average During Baseline (mg/L) | Standard Deviation (%)[a] | Average During Evaporation (mg/L) | Standard Deviation (%) |
|---|---|---|---|---|---|
| Arsenic | 5 | 0.111 | 63.6 | 0.027 | 18.7 |
| Barium | 100 | 0.480 | 16.8 | 0.405 | 15.7 |
| Cadmium | 1 | 0.006 | 52.9 | 0.008 | 0.0 |
| Chromium | 5 | 0.039 | 44.6 | 0.037 | 26.8 |
| Lead | 5 | 0.004 | 70.1 | 0.005 | 47.1 |
| Mercury | 0.2 | 0.001 | 70.2 | 0.001 | 64.3 |
| Nickel | 20[b] | 0.145 | 60.3 | 0.990 | 15.7 |
| Selenium | 1 | 0.252 | 78.0 | 0.043 | 9.9 |
| Silver | 5 | ND[c] | | ND | |
| Thallium | 7[b] | ND | | ND | |

[a]The standard deviation is expressed as a percent of the average concentration.
[b]ND = Not Detected, below analytical detection limit.
[c]Toxicity threshold limits for nickel and thallium have not been established under RCRA. The given limits for these metals are based on the California Toxicity Criteria and are shown for illustrative purposes only.

lead, and nickel in samples collected during BCCW evaporation all increased from baseline values. However, as with the economizer ash, only the increase in nickel concentration is statistically significant, indicating that the increased concentration of this metal was a direct result of BCCW evaporation.

ESP Outlet Flue Gas. Elemental mass emission rates in the flue gas during coal-fired evaporation are presented in Table 8-9. No statistically significant increases in the elemental mass rates over baseline data were measured for any metal. Table 8-10 summarizes the flue gas characterization data measured at the ESP. Statistical analysis of TCO data indicates there was no significant impact on TCO concentrations as a result of BCCW evaporation. The TCO chromatograms were also inspected to determine if the same compounds were present in both baseline and evaporation test samples. All chromatograms were similar, and, with the exception of two unidentified compounds absent in the baseline emissions and present only as a small fraction of the TCO in the evaporation samples, only slight differences in concentration of the components were observed. No significant changes in TCO were observed during evaporation testing in the gas and oil/gas-fired tests.

The concentrations of acid gases HCl and HF were not significantly affected by the evaporation of the BCCW in any of the evaporation tests. The $NO_x$ concentration of flue gases appears to have decreased during evaporation testing in both coal-fired and oil/gas-fired boilers, but the amount is not significant at the 95 percent confidence level. Volatile organics were found in very low concentrations in flue gases during both baseline operation and evaporation testing in all cases, making data interpretation difficult. Evaporation of BCCW generally had very little effect on the volatile organics concentrations, but may have lowered volatile organic concentrations in the coal-fired testing by a small amount. Oil/gas-fired evaporation tests showed volatile organic levels near the detection limits.

## EFFECTS ON PLANT PROCESSES

Evaporation of BCCW in a boiler requires the consumption of energy that would otherwise be used for steam production. A number of operating conditions can therefore be expected to vary from their normal values. Observed variations from normal operating conditions can be used to determine the effects of BCCW evaporation on boiler operation. Table 8-11 shows average operating data obtained from the process control system during baseline and test conditions at the coal-fired plant. The November 3 data are shown separately because the average load on that day was the same as during the evaporation testing period.

Table 8-9

AVERAGE ELEMENTAL MASS RATES IN FLUE GAS
DURING BCCW EVAPORATION IN A COAL-FIRED POWER PLANT

| Element | Average During Baseline (lb/hr) | Standard Deviation[a] (%) | Average During Evaporation (lb/hr) | Standard Deviation (%) |
|---|---|---|---|---|
| Aluminum | 8.04 | 0.8 | 9.41 | 19.5 |
| Antimony | 0.011 | 35.5 | 0.008 | 141 |
| Arsenic | 0.048 | 17.2 | 0.065 | 23.1 |
| Barium | 0.193 | 34.4 | 0.295 | 12.4 |
| Beryllium | 0.002 | 21.4 | 0.002 | 8.0 |
| Cadmium | 0.081 | 21.1 | 0.092 | 6.3 |
| Calcium | 1.14 | 9.2 | 1.16 | 1.7 |
| Chromium | 0.076 | 7.8 | 0.080 | 9.6 |
| Cobalt | 0.008 | 11.0 | 0.010 | 14.7 |
| Copper | 0.049 | 43.8 | 0.062 | 25.3 |
| Iron | 5.16 | 9.9 | 6.76 | 21.1 |
| Lead | 0.023 | 12.6 | 0.025 | 4.3 |
| Magnesium | 0.528 | 2.5 | 0.587 | 13.5 |
| Manganese | 0.036 | 12.0 | 0.040 | 1.2 |
| Molybdenum | 0.030 | 9.7 | 0.031 | 7.8 |
| Nickel | 0.042 | 20.2 | 0.031 | 20.1 |
| Potassium | 1.67 | 5.2 | 1.90 | 18.2 |
| Silicon | NA[b] | | NA | |
| Silver | 0.001 | 173 | ND[c] | |
| Sodium | 0.619 | 31.3 | 0.725 | 1.7 |
| Thallium | ND | | 0.004 | 141 |
| Vanadium | 0.057 | 26.0 | 0.054 | 21.4 |
| Zinc | 0.149 | 14.5 | 0.164 | 12.5 |

[a]The standard deviation is expressed as a percent of the average mass rate.
[b]NA = Not analyzed.
[c]ND = Not detected, below analytical detection limit.

## Table 8-10

## SUMMARY OF FLUE GAS CHARACTERIZATION DATA FOR BCCW EVAPORATION IN A COAL-FIRED POWER PLANT

| Date | Operation | Average Unit Load (Megawatts) | Average Moisture Content (%) | Average Temperature (°F) | Average Volumetric Flow Rate (dscf/min)[a] | Particulate Mass Rate (lbs/hr) ESP Inlet | Particulate Mass Rate (lbs/hr) ESP Outlet | Average Concentration of Acid Gases (ppm) HCl | Average Concentration of Acid Gases (ppm) HF | Average $NO_x$ Concentration (ppm) | Average TCO Concentration ($\mu g/m^3$)[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Nov 3, 1987 | Baseline | 1989 | 8.3 | 267 | 450,000 | 11,500 | NA | 3.8 | 0.3 | 410 | 470 |
| Nov 4, 1987 | Baseline | 195 | 7.8 | 264 | 447,000 | 11,700 | 60 | 5.6 | 0.1 | NA | 59 |
| Nov 4, 1987 | Baseline | 195 | 7.5 | 264 | 447,000 | 10,700 | 83 | NA | NA | 690 | ND |
| Nov 5, 1987 | Baseline | 200 | 7.3 | 257 | 408,000 | 14,900 | 70 | 7.4 | 1.6 | 780 | 144 |
| Nov 6, 1987 | Baseline | 195 | 7.1 | 235 | 412,000 | 10,500 | 79 | 7.0 | .9 | 760 | 237 |
| Nov 8, 1987 | Evaporation | 189 | 9.6 | 288 | 412,000 | 11,900 | 96 | 4.1 | .6 | 660 | 272 |
| Nov 8, 1987 | Evaporation | 189 | 10.1 | 288 | 412,000 | 12,000 | 60 | 5.0 | .9 | 650 | 266 |

[a] dscf/min = Dry Standard Cubic Feet Per Minute

[b] $\mu g/m^3$ = Microgram Per Cubic Meter

NA = Not Analyzed

ND = Not Detected, below analytical detection limit

During BCCW evaporation at the coal-fired plant, flue gas exiting the air preheaters was kept about 30 degrees Fahrenheit hotter than usual due to the possibility of sulfuric acid condensation in the air preheater. The resulting increase in the cold end temperature represents a reduction in the thermal efficiency of the plant, and is reflected in the reduced steam/coal production ratio during waste evaporation, and the resulting lower MW/coal ratio.

COSTS OF BCCW EVAPORATION

Calculation of the additional fuel costs to evaporate the waste, either from the costs represented by deviations from design set points for plant operation (as assigned by the plant computer) or from the theoretical energy requirement to evaporate the 60,000 gallons of waste, yields a cost of about $800-880. Similar calculations for gas-fired BCCW evaporation give a fuel cost of about $1,750.

Using the performance data in Table 8-11, the cost of BCCW can also be estimated in terms of lost revenue. Over the 14 hour injection period, the MW/coal ratio was 2.588 MW/ton compared with 2.627 for all baseline data and 2.678 for the November 3 baseline data. Using these data and a constant coal consumption rate of 73 tons per hour, the reduction in electrical output was estimated to be between 30,000 and 70,000 KWh. Assuming a retail price of $0.08/KWh, this translates to a gross revenue loss of between $2,300 and $5,900. Calculation of revenue loss from gas-fired BCCW evaporation also gives a value of about $5,900.

The contractor cost for evaporation of BCCW at the coal-fired utility was approximately $3,000-$4,000. This cost covered the contractor's tanks and other equipment, labor, and subsistence charges for the waste evaporation portion of the chemical cleaning contract. Using utility personnel, and a storage pond rather than rented tanks, the labor and material costs for BCCW evaporation were estimated to be about $350 at the oil/gas-fired utility, based on an estimated 12 hours of labor time required per evaporation event.

Permit fees and the time spent by regulatory liaison personnel on permit applications are another cost of BCCW evaporation. Permitting requirements may vary considerably, depending on site location; permit amendments will generally be required at a minimum. The cost for a permit amendment at one plant was $100 for application fee and an estimated $1200 in labor and related expenses to prepare the application. Regulatory requirements for testing may also add to the expense of BCCW evaporation, depending on local rules. These costs are summarized in Table 8-12. If RCRA

Table 8-11

AVERAGE OPERATING DATA[a]

| Parameter | Baseline - all (27 data points) | Baseline - Nov. 3 (6 data points) | Evaporation (11 data points) |
|---|---|---|---|
| Gross load - MW | 195 | 189 | 189 |
| Coal feed - ton/hr | 74.3 | 70.6 | 73.10 |
| Boiler efficiency - % | 90.70 | 90.99 | 90.3 |
| Avg. cold end temp - °F | 168 | 171 | 208 |
| Lowest gas temp - °F | 254 | 256 | 286 |
| Excess air - % | 19.2 | 19.7 | 19.2 |
| Flue gas oxygen - % | 3.50 | 3.58 | 3.51 |
| Probable heat rate - Btu/kWh | 9,490 | 9,480 | 9,680 |
| Steam/coal - klb/ton | 18.72 | 18.89 | 18.18 |
| MW/coal - MW/ton | 2.627 | 2.678 | 2.588 |

[a]Coal-fired power plant

Table 8-12

BCCW EVAPORATION COSTS

| Item | Coal-Fired Unit | Oil/Gas-Fired Unit |
|---|---|---|
| Fuel | $ 880 | $1,750 |
| Revenue Loss | $2,300 - 5,900 | $5,900 |
| Contractor Labor | $3,500 - 4,700 | ---- |
| Utility Labor | ---- | $ 350 |
| Permit Application | $ 100 | $ 230[a] |
| Regulatory Liaison | $ 1,200 | ---- |
| TOTAL | $7,980-12,780 | $8,230 |

[a]Cost for testing required by existing permit; no permit amendment was required for waste evaporation at this facility.

permitting is required, permit application costs will be greatly increased; an estimated range of costs for preparation of a RCRA permit application is $150,000-$350,000.

CONSIDERATIONS

The evaporation of BCCW solutions containing HCl may create problems with stress corrosion, especially for stainless steel components. Chloride ion concentrations may be controlled by reducing the BCCW injection rate, and most of the acid should be removed by scrubbers, if they are present downstream. However the evaporation of hydrochloric acid based cleaning wastes may not be advisable in some cases. The effect of BCCW evaporation on boiler life or manufacturer's warranties is also a consideration. Evaporation of BCCW in some boilers may void the manufacturers warranty. Manufacturers differ concerning the advisability of BCCW evaporation; one manufacturer was actively researching the evaporation of HCl-based BCCW in their boilers, while another manufacturer advised against the evaporation of any wastes in their boilers (1).

Evaporation of BCCW, whether hazardous or nonhazardous, may affect boiler emissions. If the BCCWs are nonhazardous, then a conventional state air permit (or amendment of an existing permit) may be required prior to evaporation. It is likely that some states would require: 1) dispersion modeling to demonstrate that health effect levels for toxic metal and organic emissions would not be exceeded at the property line; and 2) performance (stack) sampling to verify predicted organic destruction once the unit is permitted.

Evaporation of BCCW that are RCRA Characteristically hazardous would entail compliance with the RCRA risk-based technical and permitting standards for industrial boilers and furnaces under 40 CFR Part 266, Subpart H. It is unlikely that any of the permit or technical standard exemptions (such as for small quantity wastes or low risk wastes burned on-site) of Subpart H would apply to evaporation of BCCW.

SUMMARY

Based on field monitoring of boiler inputs and outputs before and during evaporation of two types of boiler chemical cleaning waste, the following conclusions were reached:

- The concentrations of metals present in the BCCWs did not exceed RCRA toxicity limits.

- The variability in ash material contributed by the coal, ± 440 pounds per hour, was greater than the 164 pounds per hour of ash contributed by the wastes.

- During both baseline and evaporation in the coal-fired boiler, 97% of the total ash exiting the boiler entered the ESP, 2% entered the bottom ash hopper, and 1% entered the economizer ash hoppers. ESP performance and particulate emissions were not affected by BCCW evaporation.

- Evaporation of BCCW during split feed oil/gas firing resulted in increases of particulate mass rate (PMR) loading of 20 and 38 percent in two tests. Evaporation during gas firing resulted in an increase in the PMR of 95%. However the total particulate mass rates were still below the New Source Performance Standards limit of 0.03 lb/million Btu of heat input. Copper and sodium were responsible for most of the increase in particulates.

- The leaching characteristics of the bottom ash, economizer ash, and precipitator ash samples from the coal-fired plant were slightly altered by BCCW evaporation, but the concentrations of the RCRA metals in the leachate samples were at least a factor of five below their toxicity limits.

- The concentrations of $NO_x$, HCl, and HF present in the flue gas were not statistically affected by the evaporation of the BCCW.

- The concentrations of volatile and semi-volatile organic compounds exiting the boiler were not statistically affected by the evaporation of the BCCW.

- Fuel consumption increased during evaporation by approximately the amount necessary to evaporate the water in the waste.

- The cost of additional fuel to evaporate the wastes, or revenue loss due to lower boiler efficiency during waste evaporation, was the main direct cost for this method of BCCW disposal. Permitting costs for waste evaporation are likely to be highly variable depending on site location.

REFERENCES

1. Electric Power Research Institute. Manual for Management of Low Volume Wastes from Fossil-Fuel-Fired Power Plants. CS-5281, Radian Corporation, July 1987.

## BOILER, TURBINE, OR FURNACE OPERATION

1. Facility identification (i.e., Unit #1, Boiler #1, etc.): Big Stone Plant – Heating Boiler

2. Manufacturer: Bros

   Purchase date: 1961 Model number: 461-03

3. Check one: Stationary X Portable

4. Type (i.e., steam boiler, gas turbine, generator, furnace, etc.): Steam boiler

5. Manufacturer's specifications:

   Maximum design operating rate: 98* million Btus per hour

   Maximum design capacity pertains to (please circle one): (heat input) or heat output

   Manufacturer's designed operating efficiency: _____ %

6. Actual or anticipated operation: Used for emergency heating when the main boiler is not operating.

   Primary and secondary fuel, fuel consumption, and fuel parameters:

| Description | Primary Fuel | Secondary Fuel |
|---|---|---|
| Fuel Type **(i.e., natural gas, #2 fuel oil, lignite coal, etc.)** | # 2 fuel oil/non-detectable PCB oil | |
| Fuel Consumption **(i.e., cubic feet/year, gallons/year, pound/year, tons/year, etc.)** | 10,000 gal/yr | |
| Hours of Operation **(hours per year)** | 20 hours @ average of 75% load | |
| Heating value **(i.e., Btus/cubic feet, Btus/gallon, Btus/pound, etc.)** | 140,000 Btu/gal | |
| Sulfur Content (Wt.%) | <0.5% | |
| Ash Content (Wt.%) | | |

*Design value only, actual heat input to boiler may exceed design

8. Has a stack test been conducted? Yes _____ No X

If a stack test(s) has been conducted, please attach a copy of the most recent stack test report to this application and skip item #9. If the Department already has a copy of the most recent stack test, please specify the date of the most recent stack test:

Date of most recent stack test:

9. Stack information (if a stack is present):

Stack height (feet): 90 feet Stack diameter (feet): 4.0 feet

10. Type of air pollution control equipment: None
(Examples: wet scrubber, cyclone, baghouse, electrostatic precipitator, etc.)

**Please complete the appropriate air pollution control equipment data sheet(s) for this unit.**

## MISCELLANEOUS PROCESS OPERATION

1. Facility identification (i.e., Unit #1, Pierre Plant, etc.): Big Stone Plant – Emergency Diesel Generator

2. Manufacturer: Waukesha Power Systems

   Date of manufacture: 1974 Model number: VHP5900 DSIU

3. Maximum design operating rate:

   Amount of material processed, consumed, or produced? _____ tons per hour
   or
   _____ pounds per hour
   or
   60.7 gallons per hour
   or (@ 8.5 mmBtu/hr)
   1000 kilowatts

**(please specify units)**

   Heat source (if applicable)? _____ million Btus per hour heat input

4. Actual or anticipated operation:

   Type of material processed, consumed, or produced? No. 2 fuel oil

   **If applicable, please provide MSDS forms for each type of chemical(s) utilized in the process.**

   Amount of material processed, consumed, or produced? 300 gal/yr (please specify units)

   Primary and secondary fuel, fuel consumption, and fuel parameters (if applicable):

| Description | Primary Fuel | Secondary Fuel |
|---|---|---|
| Fuel Type **(i.e., natural gas, #2 fuel oil, lignite coal, etc.)** | #2 fuel oil/non-detectable PCB oil | |
| Fuel Consumption **(i.e., cubic feet/hour, gallons/hour, pound/hour, tons/hour, etc.)** | 60.7 gal/hr | |
| Heating value **(i.e., Btus/cubic feet, Btus/gallon, Btus/pound, etc.)** | 140,000 | |
| Sulfur Content (Wt.%) | <0.5% | |
| Ash Content (Wt.%) | | |

5. Has a stack test or other forms of testing been conducted? Yes _____ No X

If a stack test or other forms of testing have been conducted, please attach a copy of the most recent report to this application and skip item #6. If the Department already has a copy of the most recent stack test or other testing methods, please specify the date of the most recent test:

Most recent test date:

6. Stack information (if a stack is present):

Stack height (feet): 23 feet Stack diameter (feet): 1 foot

7. Type of air pollution control equipment: None
(Examples: wet scrubber, cyclone, baghouse, electrostatic precipitator, etc.)

**Please complete the appropriate air pollution control equipment data sheet(s) for this unit.**

## MISCELLANEOUS PROCESS OPERATION

1. Facility identification (i.e., Unit #1, Pierre Plant, etc.): Big Stone Plant – Live Fuel Storage Building Transfer Point

2. Manufacturer: _____

   Date of manufacture: 1974 Model number:

3. Maximum design operating rate:

   Amount of material processed, consumed, or produced? 3000 tons per hour
   or
   _____ pounds per hour
   or
   _____ gallons per hour
   or

   **(please specify units)**

   Heat source (if applicable)? _____ million Btus per hour heat input

4. *Actual or anticipated operation:*

   Type of material processed, consumed, or produced? Materials handling of approved solid, primary and secondary fuel

   **If applicable, please provide MSDS forms for each type of chemical(s) utilized in the process.**

   Amount of material processed, consumed, or produced? Btu equivalent of up to 2,270,000 tons per year of subbituminous coal (please specify units)

   Primary and secondary fuel, fuel consumption, and fuel parameters (if applicable):

| Description | Primary Fuel | Secondary Fuel |
|---|---|---|
| Fuel Type **(i.e., natural gas, #2 fuel oil, lignite coal, etc.)** | | |
| Fuel Consumption **(i.e., cubic feet/hour, gallons/hour, pound/hour, tons/hour, etc.)** | | |
| Heating value **(i.e., Btus/cubic feet, Btus/gallon, Btus/pound, etc.)** | | |
| Sulfur Content (Wt.%) | | |
| Ash Content (Wt.%) | | |

5. Has a stack test or other forms of testing been conducted? Yes _____ No X

If a stack test or other forms of testing have been conducted, please attach a copy of the most recent report to this application and skip item #6. If the Department already has a copy of the most recent stack test or other testing methods, please specify the date of the most recent test:

Most recent test date:

6. Stack information (if a stack is present): Baghouse Outlet and Building Ridge Vent

Stack height (feet): 43.33 feet Stack diameter (feet): 1.67 feet
Building Ridge Vent 68.33 feet

7. Type of air pollution control equipment: Baghouse on Live Storage Building Transfer Point
(Examples: wet scrubber, cyclone, baghouse, electrostatic precipitator, etc.)

**Please complete the appropriate air pollution control equipment data sheet(s) for this unit.**

**BAGHOUSE DATA SHEET**

**Company name:** Otter Tail Power Company

**Company Location:** Big Stone Plant

**Emission Unit(s) served by this baghouse(please list all units):**

1. Live Storage Building Transfer Point
2. _____
3. _____

**Manufacturer Information:**

Manufacturer: Ray Jet Filter System – Model 8M-20 (F-72)

Manufacturer date: 1974 Installation date: 1974
**Scheduled for replacement in 2002**
Manufacturer's designed control efficiency: _____%

Type of baghouse (please check one): Reverse air _____ Pulse Jet X Shaker _____ Other

Type of bags: Polypropylene

Number of bags: 96

Air/Cloth Ratio: 8.31 / 1

**Facility Operation and Maintenance:**

*Pressure drop across baghouse:* 1 to 20 inches $H_2O$ (normal) _____ inches $H_2O$ (maximum)

Inlet Temperature: Ambient ℉ (minimum) _____ ℉ (maximum)

Outlet Temperature: _____ ℉ (minimum) _____ ℉ (maximum)

Inlet air flow rate: 8300 CFM

Describe maintenance of baghouse (use of dye test, visual inspections, changing bags, etc.):

The fabric filter is operated from, and alarmed to, the railcar unloading bumper control cab. Alarms are responded to by the yard operator. The unit is inspected as per the attached schedule.

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| ITEM | DEPT |
|---|---|
| Du[redacted] Collector 2&3 Convy. Live Storage - F2C | 1 |

| FLOOR | EQUIPMENT |
|---|---|
| | F-72 |

a. Grease seal bearings on rotor-shaft, use Mobilith AW2 ____

b. Check air seal ____

c. Check belts & grease fan bearings, use Mobilith AW2 ____

d. Check auger-drive & grease, use Mobilith AW2 ____

e. Check rotary seals, grease both ends, use Mobilith AW2 ____

f. Check chain on rotary seals ____

g. Check speed reducer gearbox & change oil, use Mobil DTE Oil BB ____

h. Check chain on auger drive ____

i. Check puffers ____

j. Check babbited pillow block bearings & lubricate cup, use Mobilith AW2 ____

1...5...10...15...20...25...30...35...40...45...50..

X

b
.
f
i
j

PERFORMED BY _____ DATE _____

## MISCELLANEOUS PROCESS OPERATION

1. Facility identification (i.e., Unit #1, Pierre Plant, etc.): Big Stone Plant – Rotary Car Dumper Conveyor

2. Manufacturer: _____

   Date of manufacture: 1974 Model number:

3. Maximum design operating rate:

   Amount of material processed, consumed, or produced? 3000 tons per hour
   or
   _____ pounds per hour
   or
   _____ gallons per hour
   or

   **(please specify units)**

   Heat source (if applicable)? _____ million Btus per hour heat input

4. Actual or anticipated operation:

   Type of material processed, consumed, or produced? Materials handling of approved solid, primary and secondary fuel

   **If applicable, please provide MSDS forms for each type of chemical(s) utilized in the process.**

   Amount of material processed, consumed, or produced? Btu equivalent of up to 2,270,000 tons per year of subbituminous coal (please specify units)

   Primary and secondary fuel, fuel consumption, and fuel parameters (if applicable):

| Description | Primary Fuel | Secondary Fuel |
|---|---|---|
| Fuel Type **(i.e., natural gas, #2 fuel oil, lignite coal, etc.)** | | |
| Fuel Consumption **(i.e., cubic feet/hour, gallons/hour, pound/hour, tons/hour, etc.)** | | |
| Heating value **(i.e., Btus/cubic feet, Btus/gallon, Btus/pound, etc.)** | | |
| Sulfur Content (Wt.%) | | |
| Ash Content (Wt.%) | | |

5. Has a stack test or other forms of testing been conducted? Yes _____ No X

If a stack test or other forms of testing have been conducted, please attach a copy of the most recent report to this application and skip item #6. If the Department already has a copy of the most recent stack test or other testing methods, please specify the date of the most recent test:

Most recent test date:

6. Stack information (if a stack is present): Baghouse outlet

Stack height (feet): 30 feet Stack diameter (feet): 2 feet

7. Type of air pollution control equipment: Baghouse
(Examples: wet scrubber, cyclone, baghouse, electrostatic precipitator, etc.)

**Please complete the appropriate air pollution control equipment data sheet(s) for this unit.**

# BAGHOUSE DATA SHEET

**Company name:** Otter Tail Power Company

**Company Location:** Big Stone Plant

**Emission Unit(s) served by this baghouse(please list all units):**

1. Rotary Car Dumper Conveyor
2. _____
3. _____

**Manufacturer Information:**

Manufacturer: Ray Jet Fabric Filter System – Model 8M-30 (F-69)

Manufacturer date: 1974 Installation date: 1974

Manufacturer's designed control efficiency: _____%

Type of baghouse (please check one): Reverse air _____ Pulse Jet X Shaker _____ Other

Type of bags: Polypropylene

Number of bags: 144

Air/Cloth Ratio: 8.01 / 1

**Facility Operation and Maintenance:**

Pressure drop across baghouse: 1 to 19 inches $H_2O$ (normal) _____ inches $H_2O$ (maximum)

Inlet Temperature: ambient ℉ (minimum) _____ ℉ (maximum)

Outlet Temperature: _____ ℉ (minimum) _____ ℉ (maximum)

Inlet air flow rate: 12,000 CFM

Describe maintenance of baghouse (use of dye test, visual inspections, changing bags, etc.):

The fabric filter is operated from, and alarmed to, the railcar unloading dumper control cab. Alarms are responded to by the yard operator. The unit is inspected as per the attached schedule.

WEEK XX | BIG STONE PREVENTATIVE MTCE | 05/17/01

| ITEM | DEPT |
|---|---|
| 1/2 Cap. Dust Collector Car Dumper - F2B | 1 |

| FLOOR | EQUIPMENT |
|---|---|
| | F-69 |

| | | |
|---|---|---|
| a. | Grease motor, use Rykon #2EP | ____ |
| b. | Check belts & grease fan bearings, use Rykon #2EP | ____ |
| c. | Check motor pulley | ____ |
| d. | Check air seal on fan | ____ |
| e. | Check for vibration | ____ |
| f. | Check rotor bearings, grease, use Rykon #2EP | ____ |
| g. | Grease gear bearings on auger, use Rykon #2EP | ____ |
| h. | Check motor on auger | ____ |
| i. | Check chain on auger drive | ____ |
| j. | Check auger speed reducer, change oil in gear box, use Am. Ind. #220 | ____ |
| k. | Check puffers | ____ |
| l. | Check piping on CO2 system | ____ |
| m. | Check & grease rotary seal. | ____ |

1...5...10...15...20...25...30...35...40...45...50..

X

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PERFORMED BY _____ DATE _____

## MISCELLANEOUS PROCESS OPERATION

1. Facility identification (i.e., Unit #1, Pierre Plant, etc.): Big Stone Plant – Rotary Car Dumper Building

2. Manufacturer: _____

   Date of manufacture: 1974 Model number:

3. Maximum design operating rate:

   Amount of material processed, consumed, or produced? 3000 tons per hour
   or
   _____ pounds per hour
   or
   _____ gallons per hour
   or

   **(please specify units)**

   Heat source (if applicable)? _____ million Btus per hour heat input

4. Actual or anticipated operation:

   Type of material processed, consumed, or produced? Materials handling of approved solid, primary and secondary fuel

   **If applicable, please provide MSDS forms for each type of chemical(s) utilized in the process.**

   Amount of material processed, consumed, or produced? Btu equivalent of up to 2,270,000 tons per year of subbituminous coal (please specify units)

   Primary and secondary fuel, fuel consumption, and fuel parameters (if applicable):

| Description | Primary Fuel | Secondary Fuel |
|---|---|---|
| Fuel Type **(i.e., natural gas, #2 fuel oil, lignite coal, etc.)** | | |
| Fuel Consumption **(i.e., cubic feet/hour, gallons/hour, pound/hour, tons/hour, etc.)** | | |
| Heating value **(i.e., Btus/cubic feet, Btus/gallon, Btus/pound, etc.)** | | |
| Sulfur Content (Wt. %) | | |
| Ash Content (Wt. %) | | |

5. Has a stack test or other forms of testing been conducted? Yes _____ No X

If a stack test or other forms of testing have been conducted, please attach a copy of the most recent report to this application and skip item #6. If the Department already has a copy of the most recent stack test or other testing methods, please specify the date of the most recent test:

Most recent test date:

6. Stack information (if a stack is present): Baghouse outlet

Stack height (feet): 11.33 feet Stack diameter (feet): 3.17 feet

7. Type of air pollution control equipment: Baghouse
(Examples: wet scrubber, cyclone, baghouse, electrostatic precipitator, etc.)

**Please complete the appropriate air pollution control equipment data sheet(s) for this unit.**

**BAGHOUSE DATA SHEET**

**Company name:** Otter Tail Power Company

**Company Location:** Big Stone Plant

**Emission Unit(s) served by this baghouse(please list all units):**

1. Rotary Car Dumper Building
2. _____
3. _____

**Manufacturer Information:**

Manufacturer: Ray Jet Fabric Filter System – Model 8M-75 (F-70) 4 units

Manufacturer date: 1974 Installation date: 1974

Manufacturer's designed control efficiency: _____%

Type of baghouse (please check one): Reverse air _____ Pulse Jet X Shaker _____ Other

Type of bags: Polypropylene

Number of bags: 360 (each unit)

Air/Cloth Ratio: 8.14 / 1

**Facility Operation and Maintenance:**

Pressure drop across baghouse: 1 to 19 inches $H_2O$ (normal) _____ inches $H_2O$ (maximum)

Inlet Temperature: Ambient ℉ (minimum) _____ ℉ (maximum)

Outlet Temperature: _____ ℉ (minimum) _____ ℉ (maximum)

Inlet air flow rate: 30,500 CFM (each unit)

Describe maintenance of baghouse (use of dye test, visual inspections, changing bags, etc.):

The fabric filter is operated from, and alarmed to, the railcar unloading dumper control cab. Alarms are responded to by the yard operator. The unit is inspected as per the attached schedule.

WEEK XX BIG STONE PREVENTATIVE MTCE 05/17/01

| ITEM | DEPT |
|---|---|
| Dust Collectors #1 Car Dumper - F2A | 1 |

| FLOOR | EQUIPMENT |
|---|---|
| | F-70 |

a. Grease motor, use Mobilith AW2 ____
b. Check belts & grease fan bearings, use Mobilith AW2 ____
c. Check motor pulley ____
d. Check air seal on fan ____
e. Check fan vibration ____
f. Check rotor bearings, grease, use Mobilith AW2 ____
g. Grease seal bearing on auger, use Mobilith AW2 ____
h. Check motor on auger ____
i. Check chain on auger drive ____
j. Check auger speed reducers, change oil in gearbox, use Mobil DTE Oil BB ____
k. Check puffers ____
l. Check piping on CO2 system ____
m. Check & grease rotary seal. ____

1...5...10...15...20...25...30...35...40...45...50.. PERFORMED BY DATE

X b i

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## MISCELLANEOUS PROCESS OPERATION

1. Facility identification (i.e., Unit #1, Pierre Plant, etc.): Big Stone Plant – Fuel Transfer House

2. Manufacturer: _____

   Date of manufacture: 1974 Model number:

3. Maximum design operating rate:

   Amount of material processed, consumed, or produced? 1,100 tons per hour
   or
   _____ pounds per hour
   or
   _____ gallons per hour
   or

   **(please specify units)**

   Heat source (if applicable)? _____ million Btus per hour heat input

4. Actual or anticipated operation:

   Type of material processed, consumed, or produced? Materials handling of approved solid, primary and secondary fuel

   **If applicable, please provide MSDS forms for each type of chemical(s) utilized in the process.**

   Amount of material processed, consumed, or produced? Btu equivalent of up to 2,270,000 tons per year of subbituminous coal (please specify units)

   Primary and secondary fuel, fuel consumption, and fuel parameters (if applicable):

| Description | Primary Fuel | Secondary Fuel |
|---|---|---|
| Fuel Type **(i.e., natural gas, #2 fuel oil, lignite coal, etc.)** | | |
| Fuel Consumption **(i.e., cubic feet/hour, gallons/hour, pound/hour, tons/hour, etc.)** | | |
| Heating value **(i.e., Btus/cubic feet, Btus/gallon, Btus/pound, etc.)** | | |
| Sulfur Content (Wt. %) | | |
| Ash Content (Wt. %) | | |

5. Has a stack test or other forms of testing been conducted? Yes _____ No X

If a stack test or other forms of testing have been conducted, please attach a copy of the most recent report to this application and skip item #6. If the Department already has a copy of the most recent stack test or other testing methods, please specify the date of the most recent test:

Most recent test date:

6. Stack information (if a stack is present): Baghouse outlet

Stack height (feet): 7.17 feet Stack diameter (feet): 3.75 x 2.75 feet

7. Type of air pollution control equipment: Baghouse
(Examples: wet scrubber, cyclone, baghouse, electrostatic precipitator, etc.)

**Please complete the appropriate air pollution control equipment data sheet(s) for this unit.**

# BAGHOUSE DATA SHEET

**Company name:** Otter Tail Power Company

**Company Location:** Big Stone Plant

**Emission Unit(s) served by this baghouse(please list all units):**

1. Fuel Transfer House
2. _____
3. _____

**Manufacturer Information:**

Manufacturer: Air-Cure

Manufacturer date: _____ Installation date: September 1995

Manufacturer's designed control efficiency: _____%

Type of baghouse (please check one): Reverse air _____ Pulse Jet X Shaker _____ Other

Type of bags: Polyester

Number of bags: 168

Air/Cloth Ratio: 6.08 / 1

**Facility Operation and Maintenance:**

Pressure drop across baghouse: 0.5 to 8 inches $H_2O$ (normal) _____ inches $H_2O$ (maximum)

Inlet Temperature: ambient ℉ (minimum) _____ ℉ (maximum)

Outlet Temperature: _____ ℉ (minimum) _____ ℉ (maximum)

Inlet air flow rate: 15,650 ACFM

Describe maintenance of baghouse (use of dye test, visual inspections, changing bags, etc.):

The fabric filter is operated from, and alarmed to, the main plant control room. Alarms are responded to by a plant operator. The unit is equipped with a Triboguard broken bag detector. The unit is inspected as per the attached schedule.

WEEK XX | BIG STONE PREVENTATIVE MTCE | 05/17/01

| ITEM | DEPT |
|---|---|
| Dust Collector Transfer House - F2D | 1 |

| FLOOR | EQUIPMENT |
|---|---|
| | Air Cure System |

a. Grease motors; Rotary valve, screw conv., filter cleaning blower, puffer drive, & exhaust fan motors Mobilith AW2 ____

b. Grease coupling; Rotary valve, screw conv., filter cleaning blower, & exhaust fan couplings, coupling grease ____

c. Check oil levels in speed reducers also in filter cleaning blower bearings ____

d. Change oil in speed reducers; screw conveyor Mobilith HD 80W-90 ____

e. Inspect & lube chain & sprockets on puffer drive units ____

f. Change oil in filter cleaning blower bearings, SAE30 Non detergent, approx. 1 qt. DTE Oil Heavy Medium ____

g. Check/clean/or replace inlet filter on filter cleaning blower. Filter No. #SMI element #2305 ____

h. Grease bearings on screw conveyor Mobilith AW2 ____

i. Grease bearings on Rotary valve Mobilith AW2 ____

j. Check counterweighted swing check valve to see if free ____

k. Inspect belt & grease fan bearings on exhaust fan Mobilith AW2 ____

Note: Rotary valve & puffer drives have lifetime synthetic oil in sealed units. Check for leaks when servicing ____

| 1...5...10...15...20...25...30...35...40...45...50.. | PERFORMED BY | DATE |
|---|---|---|
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## MISCELLANEOUS PROCESS OPERATION

1. Facility identification (i.e., Unit #1, Pierre Plant, etc.): Big Stone Plant – North fuel conveying system and silo vents

2. Manufacturer: _____

   Date of manufacture: 1974 Model number:

3. Maximum design operating rate:

   Amount of material processed, consumed, or produced? 550 tons per hour
   or
   _____ pounds per hour
   or
   _____ gallons per hour
   or

   **(please specify units)**

   Heat source (if applicable)? _____ million Btus per hour heat input

4. Actual or anticipated operation:

   Type of material processed, consumed, or produced? Materials handing of approved solid, primary and secondary fuel

   **If applicable, please provide MSDS forms for each type of chemical(s) utilized in the process.**

   Amount of material processed, consumed, or produced? Btu equivalent of up to 1,135,000 tons per year of subbituminous coal (please specify units)

   Primary and secondary fuel, fuel consumption, and fuel parameters (if applicable):

| Description | Primary Fuel | Secondary Fuel |
|---|---|---|
| Fuel Type **(i.e., natural gas, #2 fuel oil, lignite coal, etc.)** | | |
| Fuel Consumption **(i.e., cubic feet/hour, gallons/hour, pound/hour, tons/hour, etc.)** | | |
| Heating value **(i.e., Btus/cubic feet, Btus/gallon, Btus/pound, etc.)** | | |
| Sulfur Content (Wt.%) | | |
| Ash Content (Wt.%) | | |

5. Has a stack test or other forms of testing been conducted? Yes _____ No X

If a stack test or other forms of testing have been conducted, please attach a copy of the most recent report to this application and skip item #6. If the Department already has a copy of the most recent stack test or other testing methods, please specify the date of the most recent test:

Most recent test date:

6. Stack information (if a stack is present): Baghouse outlet

Stack height (feet): 128 feet Stack diameter (feet): 2 x 2 feet

7. Type of air pollution control equipment: Baghouse
(Examples: wet scrubber, cyclone, baghouse, electrostatic precipitator, etc.)

**Please complete the appropriate air pollution control equipment data sheet(s) for this unit.**

**BAGHOUSE DATA SHEET**

**Company name:** Otter Tail Power Company

**Company Location:** Big Stone Plant

**Emission Unit(s) served by this baghouse(please list all units):**

1. North Fuel Conveying System and Silo Vents
2. 
3. 

**Manufacturer Information:**

Manufacturer: Ray Jet Fabric Filter System – Model 8M-35 (F-76)

Manufacturer date: 1974 Installation date: 1974
**Scheduled for replacement in September 2001**
Manufacturer's designed control efficiency: _____%

Type of baghouse (please check one): Reverse air _____ Pulse Jet X Shaker _____ Other

Type of bags: Polypropylene

Number of bags: 168

Air/Cloth Ratio: 8.12 / 1

**Facility Operation and Maintenance:**

Pressure drop across baghouse: 1 to 17 inches $H_2O$ (normal)_____ inches $H_2O$ (maximum)

Inlet Temperature: 40 ℉ (minimum) 120 ℉ (maximum)

Outlet Temperature: _____ ℉ (minimum) _____ ℉ (maximum)

Inlet air flow rate: 14,200 CFM

Describe maintenance of baghouse (use of dye test, visual inspections, changing bags, etc.):

The fabric filter is operated from, and alarmed to, the main plant control room. Alarms are responded to by a plant operator. The unit is inspected as per the attached schedule.

WEEK XX | BIG STONE PREVENTATIVE MTCE | 05/17/01

| ITEM | DEPT |
|---|---|
| Dust Coll. S&N Side Coal Conv.Gallery - F2E | 1 |

| FLOOR | EQUIPMENT |
|---|---|
| | F-76 - F-78 |

a. Grease motor, use Rykon #2EP ___

b. Check rotary seals, grease both ends, use Rykon #2EP ___

c. Check belts ___

d. Check auger drive & grease, use Rykon #2EP ___

e. Check air seal ___

f. Check chain & rotary seals ___

g. Check speed reducer & change oil, use Am. Ind. #100 both reducers ___

h. Check puffers ___

i. Check chain on auger drive ___

j. Check babbited pillow block bearings & lubricate cup, use 2EP ___

k. Grease bearings on blower fan shaft - 2EP ___

1...5...10...15...20...25...30...35...40...45...50..

X

b

.

f

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j

k

PERFORMED BY _____ DATE _____

## MISCELLANEOUS PROCESS OPERATION

1. Facility identification (i.e., Unit #1, Pierre Plant, etc.): Big Stone Plant – South fuel conveying system, silo vents, and plant distribution bin

2. Manufacturer: _____

   Date of manufacture: 1974 Model number:

3. Maximum design operating rate:

   Amount of material processed, consumed, or produced? 550 tons per hour
   or
   _____ pounds per hour
   or
   _____ gallons per hour
   or

   **(please specify units)**

   Heat source (if applicable)? _____ million Btus per hour heat input

4. Actual or anticipated operation:

   Type of material processed, consumed, or produced? Materials handling of approved solid, primary and secondary fuel

   **If applicable, please provide *MSDS* forms for each type of chemical(s) utilized in the process.**

   Amount of material processed, consumed, or produced? Btu equivalent of up to 2,270,000 tons per year of subbituminous coal (please specify units)

   Primary and secondary fuel, fuel consumption, and fuel parameters (if applicable):

| Description | Primary Fuel | Secondary Fuel |
|---|---|---|
| Fuel Type **(i.e., natural gas, #2 fuel oil, lignite coal, etc.)** | | |
| Fuel Consumption **(i.e., cubic feet/hour, gallons/hour, pound/hour, tons/hour, etc.)** | | |
| Heating value **(i.e., Btus/cubic feet, Btus/gallon, Btus/pound, etc.)** | | |
| Sulfur Content (Wt.%) | | |
| Ash Content (Wt.%) | | |

5. Has a stack test or other forms of testing been conducted? Yes _____ No __X__

If a stack test or other forms of testing have been conducted, please attach a copy of the most recent report to this application and skip item #6. If the Department already has a copy of the most recent stack test or other testing methods, please specify the date of the most recent test:

Most recent test date:

6. Stack information (if a stack is present): Baghouse outlet

Stack height (feet): __128__ Stack diameter (feet): __2 x 2 feet__

7. Type of air pollution control equipment: Baghouse
(Examples: wet scrubber, cyclone, baghouse, electrostatic precipitator, etc.)

**Please complete the appropriate air pollution control equipment data sheet(s) for this unit.**

**BAGHOUSE DATA SHEET**

**Company name:** Otter Tail Power Company

**Company Location:** Big Stone Plant

**Emission Unit(s) served by this baghouse(please list all units):**

1. South Fuel Conveying System, Silo Vents, and Distribution Bin
2. _____
3. _____

**Manufacturer Information:**

Manufacturer: Ray Jet Fabric Filter System – Model 8M-40 (F-78)

Manufacturer date: 1974 Installation date: 1974
**Scheduled for replacement in September 2001**
Manufacturer's designed control efficiency: _____%

Type of baghouse (please check one): Reverse air _____ Pulse Jet X Shaker _____ Other

Type of bags: Polypropylene

Number of bags: 192

Air/Cloth Ratio: 8.26 / 1

**Facility Operation and Maintenance:**

Pressure drop across baghouse: 1 to 17 inches $H_2O$ (normal) _____ inches $H_2O$ (maximum)

Inlet Temperature: 40 ℉ (minimum) 120 ℉ (maximum)

Outlet Temperature: _____ ℉ (minimum) _____ ℉ (maximum)

Inlet air flow rate: 16,500 CFM

Describe maintenance of baghouse (use of dye test, visual inspections, changing bags, etc.):

The fabric filter is operated from, and alarmed to, the main plant control room. Alarms are responded to by a plant operator. The unit is inspected as per the attached schedule.

WEEK XX | BIG STONE PREVENTATIVE MTCE | 05/17/01

| ITEM | DEPT |
|---|---|
| Dust Coll. S&N Side Coal Conv.Gallery - F2E | 1 |

| FLOOR | EQUIPMENT |
|---|---|
| | F-76 - F-78 |

a. Grease motor, use Rykon #2EP ___

b. Check rotary seals, grease both ends, use Rykon #2EP ___

c. Check belts ___

d. Check auger drive & grease, use Rykon #2EP ___

e. Check air seal ___

f. Check chain & rotary seals ___

g. Check speed reducer & change oil, use Am. Ind. #100 both reducers ___

h. Check puffers ___

i. Check chain on auger drive ___

j. Check babbited pillow block bearings & lubricate cup, use 2EP ___

k. Grease bearings on blower fan shaft - 2EP ___

1...5...10...15...20...25...30...35...40...45...50.. PERFORMED BY DATE

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## MISCELLANEOUS PROCESS OPERATION

1. Facility identification (i.e., Unit #1, Pierre Plant, etc.): Big Stone Plant – Fly Ash Storage Silo

2. Manufacturer: _____

   Date of manufacture: 1974 Model number:

3. Maximum design operating rate:

   Amount of material processed, consumed, or produced? 19 tons per hour
   or
   _____ pounds per hour
   or
   _____ gallons per hour
   or

   **(please specify units)**

   Heat source (if applicable)? _____ million Btus per hour heat input

4. Actual or anticipated operation:

   Type of material processed, consumed, or produced? Ash from facility fuel combustion
   **If applicable, please provide MSDS forms for each type of chemical(s) utilized in the process.**

   Amount of material processed, consumed, or produced? Est. up to 62,000 tons/yr (please specify units)

   Primary and secondary fuel, fuel consumption, and fuel parameters (if applicable):

| Description | Primary Fuel | Secondary Fuel |
|---|---|---|
| Fuel Type **(i.e., natural gas, #2 fuel oil, lignite coal, etc.)** | | |
| Fuel Consumption **(i.e., cubic feet/hour, gallons/hour, pound/hour, tons/hour, etc.)** | | |
| Heating value **(i.e., Btus/cubic feet, Btus/gallon, Btus/pound, etc.)** | | |
| Sulfur Content (Wt.%) | | |
| Ash Content (Wt.%) | | |

5. Has a stack test or other forms of testing been conducted? Yes _____ No X

If a stack test or other forms of testing have been conducted, please attach a copy of the most recent report to this application and skip item #6. If the Department already has a copy of the most recent stack test or other testing methods, please specify the date of the most recent test:

Most recent test date:

6. Stack information (if a stack is present): Baghouse Outlet

Stack height (feet): 112.75 feet Stack diameter (feet): 1.08 x 0.92 feet

7. Type of air pollution control equipment: Baghouse
(Examples: wet scrubber, cyclone, baghouse, electrostatic precipitator, etc.)

**Please complete the appropriate air pollution control equipment data sheet(s) for this unit.**

**BAGHOUSE DATA SHEET**

**Company name:** Otter Tail Power Company

**Company Location:** Big Stone Plant

**Emission Unit(s) served by this baghouse(please list all units):**

1. Fly Ash Storage Silo
2. _____
3. _____

**Manufacturer Information:**

Manufacturer: The W. W. Sly Manufacturing Co. – Model WW Sly #8A

Manufacturer date: 1974 Installation date: 1974

Manufacturer's designed control efficiency: _____%

Type of baghouse (please check one): Reverse air X Pulse Jet _____ Shaker _____ Other

Type of bags: Polyester Felt

Number of bags: 96

Air/Cloth Ratio: 2.05 / 1

**Facility Operation and Maintenance:**

Pressure drop across baghouse: 2 to 3 inches $H_2O$ (normal) 4.0 inches $H_2O$ (maximum)

Inlet Temperature: ambient ℉ (minimum) _____ ℉ (maximum)

Outlet Temperature: _____ ℉ (minimum) _____ ℉ (maximum)

Inlet air flow rate: 4310 ACFM

Describe maintenance of baghouse (use of dye test, visual inspections, changing bags, etc.):

The fabric filter is alarmed to the main plant control room. Alarms are responded to by a plant operator.

The unit is inspected per the attached schedule.

WEEK XX | BIG STONE PREVENTATIVE MTCE | 05/17/01

| ITEM | DEPT |
|---|---|
| Flash Silo Bag Filter System - B3 | 1 |

FLOOR

EQUIPMENT

a. Exhaust fan brgs. use Mobilith AW2 ____

b. Exhaust fan motor brgs. use Mobilith AW2 ____

c. Blow-back blower brgs. use Mobilith AW2 ____

d. Blow-back motor brgs. use Mobilith AW2 ____

e. Blow-back exhaust fan brgs. use Mobilith AW2 ____

f. Blow-back exhaust fan motor brgs. use Mobilith AW2 ____

g. Traveler gearhead motor drive (oil fill 1/2 pt.)Mobilgear 630 ____

h. Hopper vavle drive gearhead motor (oil fill) Mobilgear 630 ____

i. Hopper rappers (check condition use Mobilith AW2 ____

j. Check traveler "Multi-Seal" face adjustment and wiper blades ____

k. Inspect "V" belts ____

l. Check fans for vibration levels with IRD 308 ____

m. Check traveler roller chain & roller dog ____

n. Check pressure relief valve on top of silo for being free to lift ____

o. Check manual shutoff dampers for air leak, be sure they are sealed ____

NOTE: Tools needed: 15/16" Boxend wrench and socket, 3/4" boxend wrench and socket crescent, 1/2" breaker bar, 7/16" socket and boxend wrench. ____

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
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| k | k | k | k | | k | k | k | k | k | c | k | k |
| l | l | l | l | | l | l | l | l | l | e | l | l |
| m | m | m | m | | m | m | m | m | m | i | m | m |
| n | n | n | n | | n | n | n | n | n | . | n | n |
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PERFORMED BY ----------

DATE -------

## MISCELLANEOUS PROCESS OPERATION

1. Facility identification (i.e., Unit #1, Pierre Plant, etc.): Big Stone Plant – Lime Storage Silo

2. Manufacturer: Chemical Metering Systems - Lime Storage Silo for Cold Lime Softner

   Date of manufacture: 2001 Model number: Not Available

3. Maximum design operating rate: 76 tons silo capacity

   Amount of material processed, consumed, or produced? 15 tons per hour
   or
   _____ pounds per hour

   _____ gallons per hour
   or

   **(please specify units)**

   Heat source (if applicable)? _____ million Btus per hour heat input

4. Actual or anticipated operation: Silo vent operation approximately 2.5 hours per month while filling silo.

   Type of material processed, consumed, or produced? Lime
   **If applicable, please provide MSDS forms for each type of chemical(s) utilized in the process.**

   Amount of material processed, consumed, or produced? 900 tons/year (please specify units)

   Primary and secondary fuel, fuel consumption, and fuel parameters (if applicable):

| Description | Primary Fuel | Secondary Fuel |
|---|---|---|
| Fuel Type **(i.e., natural gas, #2 fuel oil, lignite coal, etc.)** | | |
| Fuel Consumption **(i.e., cubic feet/hour, gallons/hour, pound/hour, tons/hour, etc.)** | | |
| Heating value **(i.e., Btus/cubic feet, Btus/gallon, Btus/pound, etc.)** | | |
| Sulfur Content (Wt.%) | | |
| Ash Content (Wt.%) | | |

5. Has a stack test or other forms of testing been conducted? Yes _____ No _X_

If a stack test or other forms of testing have been conducted, please attach a copy of the most recent report to this application and skip item #6. If the Department already has a copy of the most recent stack test or other testing methods, please specify the date of the most recent test:

Most recent test date:

6. Stack information (if a stack is present): No stack - The fabric filter sits on top of the 40 foot silo. The discharge is approximately 45 feet above ground level.
Stack height (feet): _____ Stack diameter (feet): _____

7. Type of air pollution control equipment: Baghouse
(Examples: wet scrubber, cyclone, baghouse, electrostatic precipitator, etc.)

**Please complete the appropriate air pollution control equipment data sheet(s) for this unit.**

# BAGHOUSE DATA SHEET

**Company name:** Otter Tail Power Company

**Company Location:** Big Stone Plant

**Emission Unit(s) served by this baghouse(please list all units):**

1. Lime Storage Silo
2. _____
3. _____

**Manufacturer Information:**

Manufacturer: Chemical Metering Systems, Inc. Drexel, Missouri - Filter Model No. 17-04

Manufacturer date: 2001 Installation date: Spring 2001

Manufacturer's designed control efficiency: Not Available – Estimated at 99% %

Type of baghouse (please check one): Reverse air _____ Pulse Jet _____ Shaker X Other

Type of bags: Cotton Satine

Number of bags: 44

Air/Cloth Ratio: 5 SCFM / 1 square foot

**Facility Operation and Maintenance:**

Pressure drop across baghouse: 3.0 inches $H_2O$ (normal) 4.5 inches $H_2O$ (maximum)

Inlet Temperature: Ambient °F (minimum) Ambient °F (maximum)

Outlet Temperature: Ambient °F (minimum) Ambient °F (maximum)

Inlet air flow rate: 1500 SCFM @ 3 inches W.C

Describe maintenance of baghouse (use of dye test, visual inspections, changing bags, etc.):

Manufacturer's recommended maintenance procedures will be followed.

United States
Environmental Protection Agency
Acid Rain Program

OMB No. 2060-0258

# Phase II Permit Application



**For more information, see instructions and refer to 40 CFR 72.30 and 72.31**

**This submission is:** X **New** • **Revised**

**STEP 1**
**Identify the source by plant name, State, and ORIS code.**

| Plant Name | State | ORIS Code |
|---|---|---|
| Big Stone Plant | SD | 6098 |

**STEP 2**
**Enter the unit ID# for each affected unit, and indicate whether a unit is being repowered and the repowering plan being renewed by entering "yes" or "no" at column c. For new units, enter the requested information in columns d and e.**

| a | b | c | d | e |
|---|---|---|---|---|
| Unit ID# | Compliance Plan: Unit Will Hold Allowances in Accordance with 40 CFR 72.9(c)(1) | Compliance Plan: Repowering Plan | New Units: Commence Operation Date | New Units: Monitor Certification Deadline |
| 1 | Yes | No | | |
| | Yes | | | |
| | Yes | | | |
| | Yes | | | |
| | Yes | | | |
| | Yes | | | |
| | Yes | | | |
| | Yes | | | |
| | Yes | | | |
| | Yes | | | |
| | Yes | | | |
| | Yes | | | |
| | Yes | | | |

**STEP 3**
***Check the box if the response in column c of Step 2 is "Yes" for any unit.***

- For each unit that is being repowered, the Repowering Extension Plan form is included.

**STEP 4**
**Read the standard requirements and certification, enter the name of the designated representative, and sign and date**

**Standard Requirements**

Permit Requirements.

(1) The designated representative of each affected source and each affected unit at the source shall:
(i) Submit a complete Acid Rain permit application (including a compliance plan) under 40 CFR part 72 in accordance with the deadlines specified in 40 CFR 72.30; and
(ii) Submit in a timely manner any supplemental information that the permitting authority determines is necessary in order to review an Acid Rain permit application and issue or deny an Acid Rain permit;
(2) The owners and operators of each affected source and each affected unit at the source shall:
(i) Operate the unit in compliance with a complete Acid Rain permit application or a superseding Acid Rain permit issued by the permitting authority; and
(ii) Have an Acid Rain Permit.

Monitoring Requirements.

(1) The owners and operators and, to the extent applicable, designated representative of each affected source and each affected unit at the source shall comply with the monitoring requirements as provided in 40 CFR part 75.
(2) The emissions measurements recorded and reported in accordance with 40 CFR part 75 shall be used to determine compliance by the unit with the Acid Rain emissions limitations and emissions reduction requirements for sulfur dioxide and nitrogen oxides under the Acid Rain Program.
(3) The requirements of 40 CFR part 75 shall not affect the responsibility of the owners and operators to monitor emissions of other pollutants or other emissions characteristics at the unit under other applicable requirements of the Act and other provisions of the operating permit for the source.

Sulfur Dioxide Requirements.

(1) The owners and operators of each source and each affected unit at the source shall:
(i) Hold allowances, as of the allowance transfer deadline, in the unit's compliance subaccount (after deductions under 40 CFR 73.34(c)) not less than the total annual emissions of sulfur dioxide for the previous calendar year from the unit; and
(ii) Comply with the applicable Acid Rain emissions limitations for sulfur dioxide.
(2) Each ton of sulfur dioxide emitted in excess of the Acid Rain emissions limitations for sulfur dioxide shall constitute a separate violation of the Act.
(3) An affected unit shall be subject to the requirements under paragraph (1) of the sulfur dioxide requirements as follows:
(i) Starting January 1, 2000, an affected unit under 40 CFR 72.6(a)(2); or
(ii) Starting on the later of January 1, 2000 or the deadline for monitor certification under 40 CFR part 75, an affected unit under 40 CFR 72.6(a)(3).
(4) Allowances shall be held in, deducted from, or transferred among Allowance Tracking System accounts in accordance with the Acid Rain Program.
(5) An allowance shall not be deducted in order to comply with the requirements under paragraph (1) of the sulfur dioxide requirements prior to the calendar year for which the allowance was allocated.
(6) An allowance allocated by the Administrator under the Acid Rain Program is a limited authorization to emit sulfur dioxide in accordance with the Acid Rain Program. No provision of the Acid Rain Program, the Acid Rain permit application, the Acid Rain permit, or an exemption under 40 CFR 72.7, 72.8, or 72.14 and no provision of law shall be construed to limit the authority of the United States to terminate or limit such authorization.
(7) An allowance allocated by the Administrator under the Acid Rain Program does not constitute a property right.

Nitrogen Oxides Requirements. The owners and operators of the source and each affected unit at the source shall comply with the applicable Acid Rain emissions limitation for nitrogen oxides.

Excess Emissions Requirements.

(1) The designated representative of an affected unit that has excess emissions in any calendar year shall submit a proposed offset plan, as required under 40 CFR part 77.
(2) The owners and operators of an affected unit that has excess emissions in any calendar year shall:
(i) Pay without demand the penalty required, and pay upon demand the interest on that penalty, as required by 40 CFR part 77; and
(ii) Comply with the terms of an approved offset plan, as required by 40 CFR part 77.

Recordkeeping and Reporting Requirements.

(1) Unless otherwise provided, the owners and operators of the source and each affected unit at the source shall keep on site at the source each of the following documents for a period of 5 years from the date the document is created. This period may be extended for cause, at any time prior to the end of 5 years, in writing by the Administrator or permitting authority:
(i) The certificate of representation for the designated representative for the source and each affected unit at the source and all documents that demonstrate the truth of the statements in the certificate of representation, in accordance with 40 CFR 72.24; provided that the certificate and documents shall be retained on site at the source beyond such 5-year period until such documents are superseded because of the submission of a new certificate of representation changing the designated representative;
(ii) All emissions monitoring information, in accordance with 40 CFR part 75, provided that to the extent that 40 CFR part 75 provides for a 3-year period for recordkeeping, the 3-year period shall apply.
(iii) Copies of all reports, compliance certifications, and other submissions and all records made or required under the Acid Rain Program; and,
(iv) Copies of all documents used to complete an Acid Rain permit application and any other submission under the Acid Rain Program or to demonstrate compliance with the requirements of the Acid Rain Program.

(2) The designated representative of an affected source and each affected unit at the source shall submit the reports and compliance certifications required under the Acid Rain Program, including those under 40 CFR part 72 subpart I and 40 CFR part 75.

| Big Stone Plant |
| --- |
| Plant Name (from Step 1) |



Liability.

(1) Any person who knowingly violates any requirement or prohibition of the Acid Rain Program, a complete Acid Rain permit application, an Acid Rain permit, or an exemption under 40 CFR 72.7, 72.8, or 72.14, including any requirement for the payment of any penalty owed to the United States, shall be subject to enforcement pursuant to section 113(c) of
the Act.
(2) Any person who knowingly makes a false, material statement in any record, submission, or report under the Acid Rain Program shall be subject to criminal enforcement pursuant to section 113(c) of the Act and 18 U.S.C. 1001.
(3) No permit revision shall excuse any violation of the requirements of the Acid Rain Program that occurs prior to the date that the revision takes effect.
(4) Each affected source and each affected unit shall meet the requirements of the Acid Rain Program.
(5) Any provision of the Acid Rain Program that applies to an affected source (including a provision applicable to the designated representative of an affected source) shall also apply to the owners and operators of such source and of the affected units at the source.
(6) Any provision of the Acid Rain Program that applies to an affected unit (including a provision applicable to the designated representative of an affected unit) shall also apply to the owners and operators of such unit. Except as provided under 40 CFR 72.44 (Phase II repowering extension plans) and 40 CFR 76.11 ($NO_x$ averaging plans), and except with regard to the requirements applicable to units with a common stack under 40 CFR part 75 (including 40 CFR 75.16, 75.17, and 75.18), the owners and operators and the designated representative of one affected unit shall not be liable for any violation by any other affected unit of which they are not owners or operators or the designated representative and that is located at a source of which they are not owners or operators or the designated representative.
(7) Each violation of a provision of 40 CFR parts 72, 73, 74, 75, 76, 77, and 78 by an affected source or affected unit, or by an owner or operator or designated representative of such source or unit, shall be a separate violation of the Act.

Effect on Other Authorities. No provision of the Acid Rain Program, an Acid Rain permit application, an Acid Rain permit, or an exemption under 40 CFR 72.7, 72.8, or 72.14 shall be construed as:

(1) Except as expressly provided in title IV of the Act, exempting or excluding the owners and operators and, to the extent applicable, the designated representative of an affected source or affected unit from compliance with any other provision of the Act, including the provisions of title I of the Act relating to applicable National Ambient Air Quality Standards or State Implementation Plans;
(2) Limiting the number of allowances a unit can hold; *provided,* that the number of allowances held by the unit shall not affect the source's obligation to comply with any other provisions of the Act;
(3) Requiring a change of any kind in any State law regulating electric utility rates and charges, affecting any State law regarding such State regulation, or limiting such State regulation, including any prudence review requirements under such State law;
(4) Modifying the Federal Power Act or affecting the authority of the Federal Energy Regulatory Commission under the Federal Power Act; or,
(5) Interfering with or impairing any program for competitive bidding for power supply in a State in which such program is established.

**Certification**

I am authorized to make this submission on behalf of the owners and operators of the affected source or affected units for which the submission is made. I certify under penalty of law that I have personally examined, and am familiar with, the statements and information submitted in this document and all its attachments. Based on my inquiry of those individuals with primary responsibility for obtaining the information, I certify that the statements and information are to the best of my knowledge and belief true, accurate, and complete. I am aware that there are significant penalties for submitting false statements and information or omitting required statements and information, including the possibility of fine or imprisonment.

| Name | Ward Uggerud | |
| --- | --- | --- |
| Signature | Ward Uggerud | Date 6-4-01 |

United States
Environmental Protection Agency
Acid Rain Program

OMB No. 2060-0258

# Phase II $NO_X$ Compliance Plan



For more information, see instructions and refer to 40 CFR 76.9

This submission is: [X] New [ ] Revised

**STEP 1**
Indicate plant name, State, and ORIS code from NADB, if applicable

| Plant Name | State | ORIS Code |
|---|---|---|
| Big Stone | SD | 6098 |

**STEP 2**

Identify each affected Group 1 and Group 2 boiler using the boiler ID# from NADB, if applicable. Indicate boiler type: "CB" for cell burner, "CY" for cyclone, "DBW" for dry bottom wall-fired, "T" for tangentially fired, "V" for vertically fired, and "WB" for wet bottom. Indicate the compliance option selected for each unit.

| | ID# 1<br>Type CY | ID#<br>Type | ID#<br>Type | ID#<br>Type | ID#<br>Type | ID#<br>Type |
|---|---|---|---|---|---|---|
| (a) Standard annual average emission limitation of 0.50 lb/mmBtu (for Phase I dry bottom wall-fired boilers) | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] |
| (b) Standard annual average emission limitation of 0.45 lb/mmBtu (for Phase I tangentially fired boilers) | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] |
| (c) EPA-approved early election plan under 40 CFR 76.8 through 12/31/07 (also indicate above emission limit specified in plan) | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] |
| (d) Standard annual average emission limitation of 0.46 lb/mmBtu (for Phase II dry bottom wall-fired boilers) | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] |
| (e) Standard annual average emission limitation of 0.40 lb/mmBtu (for Phase II tangentially fired boilers) | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] |
| (f) Standard annual average emission limitation of 0.68 lb/mmBtu (for cell burner boilers) | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] |
| (g) Standard annual average emission limitation of 0.86 lb/mmBtu (for cyclone boilers) | [X] | [ ] | [ ] | [ ] | [ ] | [ ] |
| (h) Standard annual average emission limitation of 0.80 lb/mmBtu (for vertically fired boilers) | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] |
| (i) Standard annual average emission limitation of 0.84 lb/mmBtu (for wet bottom boilers) | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] |
| (j) $NO_x$ Averaging Plan (include $NO_x$ Averaging form) | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] |
| (k) Common stack pursuant to 40 CFR 75.17(a)(2)(i)(A) (check the standard emission limitation box above for most stringent limitation applicable to any unit utilizing stack) | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] |
| (l) Common stack pursuant to 40 CFR 75.17(a)(2)(i)(B) with $NO_x$ Averaging (check the $NO_x$ Averaging Plan box and include $NO_x$ Averaging form) | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] |

**STEP 2, cont'd.**

| | ID# / Type | ID# / Type | ID# / Type | ID# / Type | ID# / Type | ID# / Type |
|---|---|---|---|---|---|---|
| **(m) EPA-approved common stack apportionment method pursuant to 40 CFR 75.17 (a)(2)(i)(C), (a)(2)(iii)(B), or (b)(2)** | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| **(n) AEL (include Phase II AEL Demonstration Period, Final AEL Petition, or AEL Renewal form as appropriate)** | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| **(o) Petition for AEL demonstration period or final AEL under review by U.S. EPA or demonstration period ongoing** | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| **(p) Repowering extension plan approved or under review** | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

**STEP 3**
**Read the standard requirements and certification, enter the name of the designated representative, sign &**

**Standard Requirements**

General. This source is subject to the standard requirements in 40 CFR 72.9 (consistent with 40 CFR 76.8(e)(1)(i)). These requirements are listed in this source's Acid Rain Permit.

**Special Provisions for Early Election Units**

Nitrogen Oxides. A unit that is governed by an approved early election plan shall be subject to an emissions limitation for $NO_x$ as provided under 40 CFR 76.8(a)(2) except as provided under 40 CFR 76.8(e)(3)(iii).
Liability. The owners and operators of a unit governed by an approved early election plan shall be liable for any violation of the plan or 40 CFR 76.8 at that unit. The owners and operators shall be liable, beginning January 1, 2000, for fulfilling the obligations specified in 40 CFR Part 77.
Termination. An approved early election plan shall be in effect only until the earlier of January 1, 2008 or January 1 of the calendar year for which a termination of the plan takes effect. If the designated representative of the unit under an approved early election plan fails to demonstrate compliance with the applicable emissions limitation under 40 CFR 76.5 for any year during the period beginning January 1 of the first year the early election takes effect and ending December 31, 2007, the permitting authority will terminate the plan. The termination will take effect beginning January 1 of the year after the year for which there is a failure to demonstrate compliance, and the designated representative may not submit a new early election plan. The designated representative of the unit under an approved early election plan may terminate the plan any year prior to 2008 but may not submit a new early election plan. In order to terminate the plan, the designated representative must submit a notice under 40 CFR 72.40(d) by January 1 of the year for which the termination is to take effect. If an early election plan is terminated any year prior to 2000, the unit shall meet, beginning January 1, 2000, the applicable emissions limitation for $NO_x$ for Phase II units with Group 1 boilers under 40 CFR 76.7. If an early election plan is terminated on or after 2000, the unit shall meet, beginning on the effective date of the termination, the applicable emissions limitation for $NO_x$ for Phase II units with Group 1 boilers under 40 CFR 76.7.

**Certification**

I am authorized to make this submission on behalf of the owners and operators of the affected source or affected units for which the submission is made. I certify under penalty of law that I have personally examined, and am familiar with, the statements and information submitted in this document and all its attachments. Based on my inquiry of those individuals with primary responsibility for obtaining the information, I certify that the statements and information are to the best of my knowledge and belief true, accurate, and complete. I am aware that there are significant penalties for submitting false statements and information or omitting required statements and information, including the possibility of fine or imprisonment.

| | |
|---|---|
| Name Ward Uggerud | |
| Signature Ward Uggerud | Date 6-4-01 |

**Compliance Assurance Monitoring Plan**
**Big Stone Plant**

## Background

Compliance Assurance Monitoring (CAM) is required for certain specified emissions sources under 40 CFR Part 64. Generally, any unit covered by a Title V permit, that meets the following criteria must have a CAM plan:

- Has potential pre-control emissions of ≥100 tons per year,
- Uses an emissions control devise,
- Has an emission limitation, and
- Does not have a continuous emissions monitor.

The Big Stone Plant emissions units that are equipped with emissions control devices are listed in Table 1. Units that require CAM plans under 40 CFR Part 64 are designated as such.

## Monitoring Approach

The proposed Compliance Assurance Monitoring approach is documented in Table 2.

## Monitoring Approach Justification

As indicated in Table 1, all of the Big Stone Plant emissions control units that require Compliance Assurance Monitoring Plans control visible and particulate emissions.

COMS, which are installed on the Unit 1 stack, are the generally accepted indicator of compliance with visible emissions limits.

While it is true that it is often difficult to establish a direct correlation between stack opacity and particulate emissions, Unit 1 historical particulate emissions tests have consistently demonstrated a substantial compliance margin. Particulate emissions during the most recent particulate emissions test were less than 6% of the applicable limit. COMS measurements ranged from approximately 10% to 18% opacity during the test. Consequently, compliance with the stack opacity limit is an indicator of compliance with the particulate emissions limit by a substantial margin.

Differential pressure is the generally accepted industry indicator of baghouse performance. The differential pressures included in Table 2 are based on the equipment manufacturer's recommendations. A properly maintained and operated baghouse should have negligible visible emissions and particulate emissions of 0.2 grains per cubic foot or less. On that basis, all process control particulate emissions are projected to be less than 25% of the allowable emission rate.

**Table 1**
**Big Stone Plant**
**CAM Requirements**

| Unit | Parameter | Control Device | Uncontrolled Potential to Emit (tons/yr) | Emission Limit | Actual Emissions[2] | Continuous Emissions Monitoring | CAM Required |
|---|---|---|---|---|---|---|---|
| Unit 1 Boiler | Visible Emissions | ESP | >100 | 20%[1] | | No | Yes |
| | Particulate | ESP | >100 | 0.26 lb/mmBtu | 0.015 lb/mmBtu | No | Yes |
| | SO2 | None | >100 | 3.0 lb/mmBtu | | Yes | No |
| | NOx | Over-fire Air | >100 | 0.86 lb/mmBtu | | Yes | No |
| Live Storage Building | Visible Emissions | Baghouse | <100 | 20%[1] | | No | No |
| | Particulate | Baghouse | <100 | 93 lb/hr | 1.42 lb/hr | No | No |
| Rotary Car Dumper Conv. | Visible Emissions | Baghouse | >100 | 20%[1] | | No | Yes |
| | Particulate | Baghouse | >100 | 93 lb/hr | 2.06 lb/hr | No | Yes |
| Rotary Car Dumper Bldg. | Visible Emissions | Baghouse | >100 | 20%[1] | | No | Yes |
| | Particulate | Baghouse | >100 | 93 lb/hr | 20.92 lb/hr | No | Yes |
| Fuel Trans. House | Visible Emissions | Baghouse | >100 | 20%[1] | | No | Yes |
| | Particulate | Baghouse | >100 | 79 lb/hr | 2.68 lb/hr | No | Yes |
| North Conveying Sys. | Visible Emissions | Baghouse | >100 | 20%[1] | | No | Yes |
| | Particulate | Baghouse | >100 | 70 lb/hr | 2.44 lb/hr | No | Yes |
| South Conveying Sys. | Visible Emissions | Baghouse | >100 | 20%[1] | | No | Yes |
| | Particulate | Baghouse | >100 | 70 lb/hr | 2.83 lb/hr | No | Yes |
| Fly Ash Silo | Visible Emissions | Baghouse | >100 | 20%[1] | | No | Yes |
| | Particulate | Baghouse | >100 | 29 lb/hr | 0.74 lb/hr | No | Yes |
| Lime Silo | Visible Emissions | Baghouse | >100 | 20%[1] | | No | Yes |
| | Particulate | Baghouse | >100 | 25.2 lb/hr | 0.26 lb/hr | No | Yes |

[1]Except during soot blowing, startup, shutdown, or malfunction. Based on a 6-minute block average.

[2]Unit 1 emissions based on 1999 emissions test data. Bag house emissions based on an emission rate of 0.2 grains per cubic foot.

**Table 2**
**Big Stone Plant**
**Monitoring Approach**

| Unit | Parameter | Indicator | Indicator Range | Monitoring Frequency | Data Collection Procedures | QA/QC Procedures |
|---|---|---|---|---|---|---|
| Unit 1 Boiler | Visible Emissions | COMS | <20% | Continuous during operation | Plant COMS DAHS | 40 CFR 60.13 and PS 1 |
| | Particulate | As above and periodic emissions tests | | | | |
| Live Storage Building | Visible Emissions | Baghouse Differential Pressure | <1 inch to >20 inches | Local and Control Room Alarm | Documentation of control equip. inspec. and maint. | Annual calibration of DP monitor |
| | Particulate | As above | | | | |
| Rotary Car Dumper Conv. | Visible Emissions | Baghouse Differential Pressure | <1 inch to >19 inches | Local and Control Room Alarm | Documentation of control equip. inspec. and maint. | Annual calibration of DP monitor |
| | Particulate | As above | | | | |
| Rotary Car Dumper Bldg. | Visible Emissions | Baghouse Differential Pressure | <1 inch to >19 inches | Local and Control Room Alarm | Documentation of control equip. inspec. and maint. | Annual calibration of DP monitor |
| | Particulate | As above | | | | |
| Fuel Trans. House | Visible Emissions | Baghouse Differential Pressure | <8 inches | Local and Control Room Alarm | Documentation of control equip. inspec. and maint. | Annual calibration of DP monitor |
| | Particulate | Triboguard Broken Bag Detector | | Local and Control Room Alarm | | |
| North Conveying Sys. | Visible Emissions | Baghouse Differential Pressure | <1 in. to >17in. (3 in. - 7 in. after 9/01) | Local and/or Control Room Alarm | Documentation of control equip. inspec. and maint. | Annual calibration of DP monitor |
| | Particulate | As above | | | | |
| South Conveying Sys. | Visible Emissions | Baghouse Differential Pressure | <1 in. to >17in. (3 in. - 7 in. after 9/01) | Local and/or Control Room Alarm | Documentation of control equip. inspec. and maint. | Annual calibration of DP monitor |
| | Particulate | As above | | | | |
| Fly Ash Silo | Visible Emissions | Baghouse Differential Pressure | <4 inches | Control Room Alarm | Documentation of control equip. inspec. and maint. | Annual calibration of DP monitor |
| | Particulate | As above | | | | |
| Lime Silo | Visible Emissions | Pressure-drop across bag house | $\geq$2.5 to $\leq$ 4.5 inches W.C. | Once during lime transfer | Documentation of control equip. inspec. and maint. | Annual calibration of DP monitor |
| | Particulate | As Above | | | | |

215 South Cascade Street
PO Box 496
Fergus Falls, Minnesota 56538-0496
218 739-8200
www.otpco.com (web site)


OTTER TAIL
Power Company

June 27, 2001

Mr. Brian Gustafson
Air Quality Administrator
Division of Environmental Services
South Dakota Department of Environment
and Natural Resources
Joe Foss Building
523 East Capitol
Pierre, SD 57501-3181

Dear Mr. Gustafson:

SUBJECT: BIG STONE PLANT – RENEWAL APPLICATION FOR TITLE V PERMIT
PERMIT NUMBER 28.0801-29
CORRECTION TO CAM PLAN

The Big Stone Plant Title V Operating Permit Application that was submitted on June 4, 2001 contains a Compliance Assurance Monitoring Plan (CAM Plan) at Tab I. Some inconsistencies were discovered in the use of the greater than and less than designations in Table 2 of the Plan. Enclosed are two copies of a revised CAM Plan that corrects those inconsistencies.

Should you have any questions on the application, please contact me at 218-739-8407.

Sincerely,

Terry Graumann
Manager, Environmental Services

Enclosures

C: Gary Gress MDU w/enclosure
Dennis Wagner – NWPS w/enclosure
Dennis Bowman – w/o enclosure

**Compliance Assurance Monitoring Plan**
**Big Stone Plant**

## Background

Compliance Assurance Monitoring (CAM) is required for certain specified emissions sources under 40 CFR Part 64. Generally, any unit covered by a Title V permit, that meets the following criteria must have a CAM plan:

- Has potential pre-control emissions of ≥100 tons per year,
- Uses an emissions control devise,
- Has an emission limitation, and
- Does not have a continuous emissions monitor.

The Big Stone Plant emissions units that are equipped with emissions control devices are listed in Table 1. Units that require CAM plans under 40 CFR Part 64 are designated as such.

## Monitoring Approach

The proposed Compliance Assurance Monitoring approach is documented in Table 2.

## Monitoring Approach Justification

As indicated in Table 1, all of the Big Stone Plant emissions control units that require Compliance Assurance Monitoring Plans control visible and particulate emissions.

COMS, which are installed on the Unit 1 stack, are the generally accepted indicator of compliance with visible emissions limits.

While it is true that it is often difficult to establish a direct correlation between stack opacity and particulate emissions, Unit 1 historical particulate emissions tests have consistently demonstrated a substantial compliance margin. Particulate emissions during the most recent particulate emissions test were less than 6% of the applicable limit. COMS measurements ranged from approximately 10% to 18% opacity during the test. Consequently, compliance with the stack opacity limit is an indicator of compliance with the particulate emissions limit by a substantial margin.

Differential pressure is the generally accepted industry indicator of baghouse performance. The differential pressures included in Table 2 are based on the equipment manufacturer's recommendations. A properly maintained and operated baghouse should have negligible visible emissions and particulate emissions of 0.2 grains per cubic foot or less. On that basis, all process control particulate emissions are projected to be less than 25% of the allowable emission rate.

**Table 1**
**Big Stone Plant**
**CAM Requirements**

| Unit | Parameter | Control Device | Uncontrolled Potential to Emit (tons/yr) | Emission Limit | Actual Emissions[2] | Continuous Emissions Monitoring | CAM Required |
|---|---|---|---|---|---|---|---|
| Unit 1 Boiler | Visible Emissions | ESP | >100 | 20%[1] | | No | Yes |
| | Particulate | ESP | >100 | 0.26 lb/mmBtu | 0.015 lb/mmBtu | No | Yes |
| | SO2 | None | >100 | 3.0 lb/mmBtu | | Yes | No |
| | NOx | Over-fire Air | >100 | 0.86 lb/mmBtu | | Yes | No |
| Live Storage Building | Visible Emissions | Baghouse | <100 | 20%[1] | | No | No |
| | Particulate | Baghouse | <100 | 93 lb/hr | 1.42 lb/hr | No | No |
| Rotary Car Dumper Conv. | Visible Emissions | Baghouse | >100 | 20%[1] | | No | Yes |
| | Particulate | Baghouse | >100 | 93 lb/hr | 2.06 lb/hr | No | Yes |
| Rotary Car Dumper Bldg. | Visible Emissions | Baghouse | >100 | 20%[1] | | No | Yes |
| | Particulate | Baghouse | >100 | 93 lb/hr | 20.92 lb/hr | No | Yes |
| Fuel Trans. House | Visible Emissions | Baghouse | >100 | 20%[1] | | No | Yes |
| | Particulate | Baghouse | >100 | 79 lb/hr | 2.68 lb/hr | No | Yes |
| North Conveying Sys. | Visible Emissions | Baghouse | >100 | 20%[1] | | No | Yes |
| | Particulate | Baghouse | >100 | 70 lb/hr | 2.44 lb/hr | No | Yes |
| South Conveying Sys. | Visible Emissions | Baghouse | >100 | 20%[1] | | No | Yes |
| | Particulate | Baghouse | >100 | 70 lb/hr | 2.83 lb/hr | No | Yes |
| Fly Ash Silo | Visible Emissions | Baghouse | >100 | 20%[1] | | No | Yes |
| | Particulate | Baghouse | >100 | 29 lb/hr | 0.74 lb/hr | No | Yes |
| Lime Silo | Visible Emissions | Baghouse | >100 | 20%[1] | | No | Yes |
| | Particulate | Baghouse | >100 | 25.2 lb/hr | 0.26 lb/hr | No | Yes |

[1]Except during soot blowing, startup, shutdown, or malfunction. Based on a 6-minute block average.

[2]Unit 1 emissions based on 1999 emissions test data. Bag house emissions based on an emission rate of 0.2 grains per cubic foot.

**Table 2**
**Big Stone Plant**
**Monitoring Approach**

| Unit | Parameter | Indicator | Indicator Range | Monitoring Frequency | Data Collection Procedures | QA/QC Procedures |
|---|---|---|---|---|---|---|
| Unit 1 Boiler | Visible Emissions | COMS | <20% | Continuous during operation | Plant COMS DAHS | 40 CFR 60.13 and PS 1 |
| | Particulate | As above and periodic emissions tests | | | | |
| Live Storage Building | Visible Emissions | Baghouse Differential Pressure | ≥1 inch to ≤20 inches | Local and Control Room Alarm | Documentation of control equip. inspec. and maint. | Annual calibration of DP monitor |
| | Particulate | As above | | | | |
| Rotary Car Dumper Conv. | Visible Emissions | Baghouse Differential Pressure | ≥1 inch to ≤19 inches | Local and Control Room Alarm | Documentation of control equip. inspec. and maint. | Annual calibration of DP monitor |
| | Particulate | As above | | | | |
| Rotary Car Dumper Bldg. | Visible Emissions | Baghouse Differential Pressure | ≥1 inch to ≤19 inches | Local and Control Room Alarm | Documentation of control equip. inspec. and maint. | Annual calibration of DP monitor |
| | Particulate | As above | | | | |
| Fuel Trans. House | Visible Emissions | Baghouse Differential Pressure | <8 inches | Local and Control Room Alarm | Documentation of control equip. inspec. and maint. | Annual calibration of DP monitor |
| | Particulate | Triboguard Broken Bag Detector | | Local and Control Room Alarm | | |
| North Conveying Sys. | Visible Emissions | Baghouse Differential Pressure | ≥1 in. to ≤17in. (2 in. - 10 in. after 9/01) | Local and/or Control Room Alarm | Documentation of control equip. inspec. and maint. | Annual calibration of DP monitor |
| | Particulate | As above | | | | |
| South Conveying Sys. | Visible Emissions | Baghouse Differential Pressure | ≥1 in. to ≤17in. (2 in. - 10 in. after 9/01) | Local and/or Control Room Alarm | Documentation of control equip. inspec. and maint. | Annual calibration of DP monitor |
| | Particulate | As above | | | | |
| Fly Ash Silo | Visible Emissions | Baghouse Differential Pressure | <4 inches | Control Room Alarm | Documentation of control equip. inspec. and maint. | Annual calibration of DP monitor |
| | Particulate | As above | | | | |
| Lime Silo | Visible Emissions | Pressure-drop across bag house | ≥2.5 to ≤ 4.5 inches W.C. | Once during lime transfer | Documentation of control equip. inspec. and maint. | Annual calibration of DP monitor |
| | Particulate | As Above | | | | |

**Compliance Assurance Monitoring Plan**
**Big Stone Plant**

## Background

Compliance Assurance Monitoring (CAM) is required for certain specified emissions sources under 40 CFR Part 64. Generally, any unit covered by a Title V permit, that meets the following criteria must have a CAM plan:

- Has potential pre-control emissions of ≥100 tons per year,
- Uses an emissions control devise,
- Has an emission limitation, and
- Does not have a continuous emissions monitor.

The Big Stone Plant emissions units that are equipped with emissions control devices are listed in Table 1. Units that require CAM plans under 40 CFR Part 64 are designated as such.

## Monitoring Approach

The proposed Compliance Assurance Monitoring approach is documented in Table 2.

## Monitoring Approach Justification

As indicated in Table 1, all of the Big Stone Plant emissions control units that require Compliance Assurance Monitoring Plans control visible and particulate emissions.

COMS, which are installed on the Unit 1 stack, are the generally accepted indicator of compliance with visible emissions limits.

While it is true that it is often difficult to establish a direct correlation between stack opacity and particulate emissions, Unit 1 historical particulate emissions tests have consistently demonstrated a substantial compliance margin. Particulate emissions during the most recent particulate emissions test were less than 6% of the applicable limit. COMS measurements ranged from approximately 10% to 18% opacity during the test. Consequently, compliance with the stack opacity limit is an indicator of compliance with the particulate emissions limit by a substantial margin.

Differential pressure is the generally accepted industry indicator of baghouse performance. The differential pressures included in Table 2 are based on the equipment manufacturer's recommendations. A properly maintained and operated baghouse should have negligible visible emissions and particulate emissions of 0.2 grains per cubic foot or less. On that basis, all process control particulate emissions are projected to be less than 25% of the allowable emission rate.

**Table 1**
**Big Stone Plant**
**CAM Requirements**

| Unit | Parameter | Control Device | Uncontrolled Potential to Emit (tons/yr) | Emission Limit | Actual Emissions[2] | Continuous Emissions Monitoring | CAM Required |
|---|---|---|---|---|---|---|---|
| Unit 1 Boiler | Visible Emissions | ESP | >100 | 20%[1] | | No | Yes |
| | Particulate | ESP | >100 | 0.26 lb/mmBtu | 0.015 lb/mmBtu | No | Yes |
| | SO2 | None | >100 | 3.0 lb/mmBtu | | Yes | No |
| | NOx | Over-fire Air | >100 | 0.86 lb/mmBtu | | Yes | No |
| Live Storage Building | Visible Emissions | Baghouse | <100 | 20%[1] | | No | No |
| | Particulate | Baghouse | <100 | 93 lb/hr | 1.42 lb/hr | No | No |
| Rotary Car Dumper Conv. | Visible Emissions | Baghouse | >100 | 20%[1] | | No | Yes |
| | Particulate | Baghouse | >100 | 93 lb/hr | 2.06 lb/hr | No | Yes |
| Rotary Car Dumper Bldg. | Visible Emissions | Baghouse | >100 | 20%[1] | | No | Yes |
| | Particulate | Baghouse | >100 | 93 lb/hr | 20.92 lb/hr | No | Yes |
| Fuel Trans. House | Visible Emissions | Baghouse | >100 | 20%[1] | | No | Yes |
| | Particulate | Baghouse | >100 | 79 lb/hr | 2.68 lb/hr | No | Yes |
| North Conveying Sys. | Visible Emissions | Baghouse | >100 | 20%[1] | | No | Yes |
| | Particulate | Baghouse | >100 | 70 lb/hr | 2.44 lb/hr | No | Yes |
| South Conveying Sys. | Visible Emissions | Baghouse | >100 | 20%[1] | | No | Yes |
| | Particulate | Baghouse | >100 | 70 lb/hr | 2.83 lb/hr | No | Yes |
| Fly Ash Silo | Visible Emissions | Baghouse | >100 | 20%[1] | | No | Yes |
| | Particulate | Baghouse | >100 | 29 lb/hr | 0.74 lb/hr | No | Yes |
| Lime Silo | Visible Emissions | Baghouse | >100 | 20%[1] | | No | Yes |
| | Particulate | Baghouse | >100 | 25.2 lb/hr | 0.26 lb/hr | No | Yes |

[1]Except during soot blowing, startup, shutdown, or malfunction. Based on a 6-minute block average.

[2]Unit 1 emissions based on 1999 emissions test data. Bag house emissions based on an emission rate of 0.2 grains per cubic foot.

**Table 2**
**Big Stone Plant**
**Monitoring Approach**

| Unit | Parameter | Indicator | Indicator Range | Monitoring Frequency | Data Collection Procedures | QA/QC Procedures |
|---|---|---|---|---|---|---|
| Unit 1 Boiler | Visible Emissions | COMS | <20% | Continuous during operation | Plant COMS DAHS | 40 CFR 60.13 and PS 1 |
| | Particulate | As above and periodic emissions tests | | | | |
| Live Storage Building | Visible Emissions | Baghouse Differential Pressure | ≥1 inch to ≤20 inches | Local and Control Room Alarm | Documentation of control equip. inspec. and maint. | Annual calibration of DP monitor |
| | Particulate | As above | | | | |
| Rotary Car Dumper Conv. | Visible Emissions | Baghouse Differential Pressure | ≥1 inch to ≤19 inches | Local and Control Room Alarm | Documentation of control equip. inspec. and maint. | Annual calibration of DP monitor |
| | Particulate | As above | | | | |
| Rotary Car Dumper Bldg. | Visible Emissions | Baghouse Differential Pressure | ≥1 inch to ≤19 inches | Local and Control Room Alarm | Documentation of control equip. inspec. and maint. | Annual calibration of DP monitor |
| | Particulate | As above | | | | |
| Fuel Trans. House | Visible Emissions | Baghouse Differential Pressure | <8 inches | Local and Control Room Alarm | Documentation of control equip. inspec. and maint. | Annual calibration of DP monitor |
| | Particulate | Triboguard Broken Bag Detector | | Local and Control Room Alarm | | |
| North Conveying Sys. | Visible Emissions | Baghouse Differential Pressure | ≥1 in. to ≤17in. (2 in. - 10 in. after 9/01) | Local and/or Control Room Alarm | Documentation of control equip. inspec. and maint. | Annual calibration of DP monitor |
| | Particulate | As above | | | | |
| South Conveying Sys. | Visible Emissions | Baghouse Differential Pressure | ≥1 in. to ≤17in. (2 in. - 10 in. after 9/01) | Local and/or Control Room Alarm | Documentation of control equip. inspec. and maint. | Annual calibration of DP monitor |
| | Particulate | As above | | | | |
| Fly Ash Silo | Visible Emissions | Baghouse Differential Pressure | <4 inches | Control Room Alarm | Documentation of control equip. inspec. and maint. | Annual calibration of DP monitor |
| | Particulate | As above | | | | |
| Lime Silo | Visible Emissions | Pressure-drop across bag house | ≥2.5 to ≤ 4.5 inches W.C. | Once during lime transfer | Documentation of control equip. inspec. and maint. | Annual calibration of DP monitor |
| | Particulate | As Above | | | | |

215 South Cascade Street
PO Box 496
Fergus Falls, Minnesota 56538-0496
218 739-8200
www.otpco.com (web site)


OTTER TAIL
Power Company

November 9, 2001

Mr. Kyrik Rombough
Air Quality Program
South Dakota Department of Environment
and Natural Resources
Joe Foss Building
523 East Capitol
Pierre, SD 57501-3181

Dear Mr. Rombough:

SUBJECT: BIG STONE PLANT - PERMIT NUMBER 28.0801-29
REQUEST FOR MINOR PERMIT AMENDMENT

As per your letter of September 5, 2001, enclosed is the Miscellaneous Process Operation form and a Baghouse Data Sheet for the control equipment changes to coal silos and conveyor dust collection system. In your letter, you asked that we clarify the number of insertable collectors that were installed. At one time, our plans were to install one collector on each of twelve coal silos. The final design includes one collector on each of two silos plus one collector at the tail-end and the head-end of Conveyor 10 for a total of eight insertable collectors. Conveyor 10 is an existing conveyor that is internal to the plant building. Its purpose is to move coal from the delivery point on the south side of the boiler building to the conveyor and coal silos on the north side of the building. We elected to use the original fans that discharged to emission point 9 and 10. Consequently, the maximum airflow remains unchanged.

As you know, the original fly ash storage silo dust collector has been replaced and a redundant collector has been added to control this process. Attached is a plan and elevation view of the collector installation. Each collector operates independent of the other. Note the illustration of the selector switch on the enclosed Diagram 1. Enclosed is a Miscellaneous Process Operation form and a Baghouse Data Sheet for these units.

It is my understanding that the above described changes will be incorporated into the reissued Title V permit as a minor permit amendment.

Should you have any questions, please contact me at 218-739-8407.

Sincerely,

Terry Graumann
Manager, Environmental Services

Enclosure

## MISCELLANEOUS PROCESS OPERATION

1. Facility identification (i.e., Unit #1, Pierre Plant, etc.): Big Stone Plant – North fuel silo vents and Head end of Conveyor 10

2. Manufacturer: _____

   Date of manufacture: 1974 Model number:

3. Maximum design operating rate:

   Amount of material processed, consumed, or produced? 550 tons per hour
   or
   _____ pounds per hour
   or
   _____ gallons per hour
   or

   **(please specify units)**

   Heat source (if applicable)? _____ million Btus per hour heat input

4. Actual or anticipated operation:

   Type of material processed, consumed, or produced? Materials handing of approved solid, primary and secondary fuel

   **If applicable, please provide MSDS forms for each type of chemical(s) utilized in the process.**

   Amount of material processed, consumed, or produced? Btu equivalent of up to 1,135,000 tons per year of subbituminous coal (please specify units)

   Primary and secondary fuel, fuel consumption, and fuel parameters (if applicable):

| Description | Primary Fuel | Secondary Fuel |
|---|---|---|
| Fuel Type **(i.e., natural gas, #2 fuel oil, lignite coal, etc.)** | | |
| Fuel Consumption **(i.e., cubic feet/hour, gallons/hour, pound/hour, tons/hour, etc.)** | | |
| Heating value **(i.e., Btus/cubic feet, Btus/gallon, Btus/pound, etc.)** | | |
| Sulfur Content (Wt.%) | | |
| Ash Content (Wt.%) | | |

5. Has a stack test or other forms of testing been conducted? Yes _____ No X

If a stack test or other forms of testing have been conducted, please attach a copy of the most recent report to this application and skip item #6. If the Department already has a copy of the most recent stack test or other testing methods, please specify the date of the most recent test:

Most recent test date:

6. Stack information (if a stack is present): Baghouse outlet

Stack height (feet): 128 feet Stack diameter (feet): 2 x 2 feet

7. Type of air pollution control equipment: Baghouse
(Examples: wet scrubber, cyclone, baghouse, electrostatic precipitator, etc.)

**Please complete the appropriate air pollution control equipment data sheet(s) for this unit.**

**BAGHOUSE DATA SHEET**

**Company name:** Otter Tail Power Company

**Company Location:** Big Stone Plant

**Emission Unit(s) served by this baghouse(please list all units):**

1. North Fuel Silo Vents – Six silos and head-end of Conveyor 10
2. 
3. 

**Manufacturer Information:**

Manufacturer: Donaldson/DCE – Model V30/15 (three units - one unit on each of two coal silos)
Donaldson/DCE – Model V30/15 – (Head end of Conveyor 10)
Manufacturer date: 2001 Installation date: October 2001

Manufacturer's designed control efficiency: 99.96+ %
(Expected outlet concentration - 0.0044 to 0.0088 grains per cubic foot)
Type of baghouse (please check one): Reverse air _____ Pulse Jet X Shaker _____ Other

Type of bags: Polyester

Number of bags: 20 elements – 323 sq./ft. three units and 269 sq. ft. for fourth unit

Air/Cloth Ratio: 11.5 / 1

**Facility Operation and Maintenance:**

Pressure drop across baghouse: 0.5 to 8 inches $H_2O$ (normal) 10 inches $H_2O$ (maximum)

Inlet Temperature: 40 ℉ (minimum) 120 ℉ (maximum)

Outlet Temperature: _____ ℉ (minimum) _____ ℉ (maximum)

Inlet air flow rate: 14,200 CFM (one common fan - total air flow from all four units)

Describe maintenance of baghouse (use of dye test, visual inspections, changing bags, etc.):

Inspection and maintenance will be as per the manufacturer's recommended procedures.

## MISCELLANEOUS PROCESS OPERATION

1. Facility identification (i.e., Unit #1, Pierre Plant, etc.): Big Stone Plant – South fuel silo vents and Tail end of Conveyor 10

2. Manufacturer: _____

   Date of manufacture: 1974 Model number:

3. Maximum design operating rate:

   Amount of material processed, consumed, or produced? 550 tons per hour
   or
   _____ pounds per hour
   or
   _____ gallons per hour
   or

   **(please specify units)**

   Heat source (if applicable)? _____ million Btus per hour heat input

4. Actual or anticipated operation:

   Type of material processed, consumed, or produced? Materials handling of approved solid, primary and secondary fuel

   **If applicable, please provide MSDS forms for each type of chemical(s) utilized in the process.**

   Amount of material processed, consumed, or produced? Btu equivalent of up to 1,135,000 tons per year of subbituminous coal (please specify units)

   Primary and secondary fuel, fuel consumption, and fuel parameters (if applicable):

| Description | Primary Fuel | Secondary Fuel |
|---|---|---|
| Fuel Type **(i.e., natural gas, #2 fuel oil, lignite coal, etc.)** | | |
| Fuel Consumption **(i.e., cubic feet/hour, gallons/hour, pound/hour, tons/hour, etc.)** | | |
| Heating value **(i.e., Btus/cubic feet, Btus/gallon, Btus/pound, etc.)** | | |
| Sulfur Content (Wt.%) | | |
| Ash Content (Wt.%) | | |

5. Has a stack test or other forms of testing been conducted? Yes _____ No _X_

If a stack test or other forms of testing have been conducted, please attach a copy of the most recent report to this application and skip item #6. If the Department already has a copy of the most recent stack test or other testing methods, please specify the date of the most recent test:

Most recent test date:

6. Stack information (if a stack is present): Baghouse outlet

Stack height (feet): _128_ Stack diameter (feet): _2 x 2 feet_

7. Type of air pollution control equipment: Baghouse
(Examples: wet scrubber, cyclone, baghouse, electrostatic precipitator, etc.)

**Please complete the appropriate air pollution control equipment data sheet(s) for this unit.**

**BAGHOUSE DATA SHEET**

**Company name:** Otter Tail Power Company

**Company Location:** Big Stone Plant

**Emission Unit(s) served by this baghouse(please list all units):**

1. South Fuel Silo Vents – Six silos and tail-end of Conveyor 10
2. 
3. 

**Manufacturer Information:**

Manufacturer: Donaldson/DCE – Model V30/15 (three units – one on each of two coal silos
Donaldson/DCE – Model V45/15 (Tail end of Conveyor 10)
Manufacturer date: 2001 Installation date: October 2001

Manufacturer's designed control efficiency: 99.96+ %
(Expected outlet concentration - 0.0044 to 0.0088 grains per cubic foot)
Type of baghouse (please check one): Reverse air _____ Pulse Jet X Shaker _____ Other

Type of bags: Polyester

Number of bags: 20 elements – 323 sq./ft. three units and 484 sq. ft. for fourth unit

Air/Cloth Ratio: 11.4 / 1

**Facility Operation and Maintenance:**

Pressure drop across baghouse: 0.5 to 8 inches $H_2O$ (normal) 10 inches $H_2O$ (maximum)

Inlet Temperature: 40 ℉ (minimum) 120 ℉ (maximum)

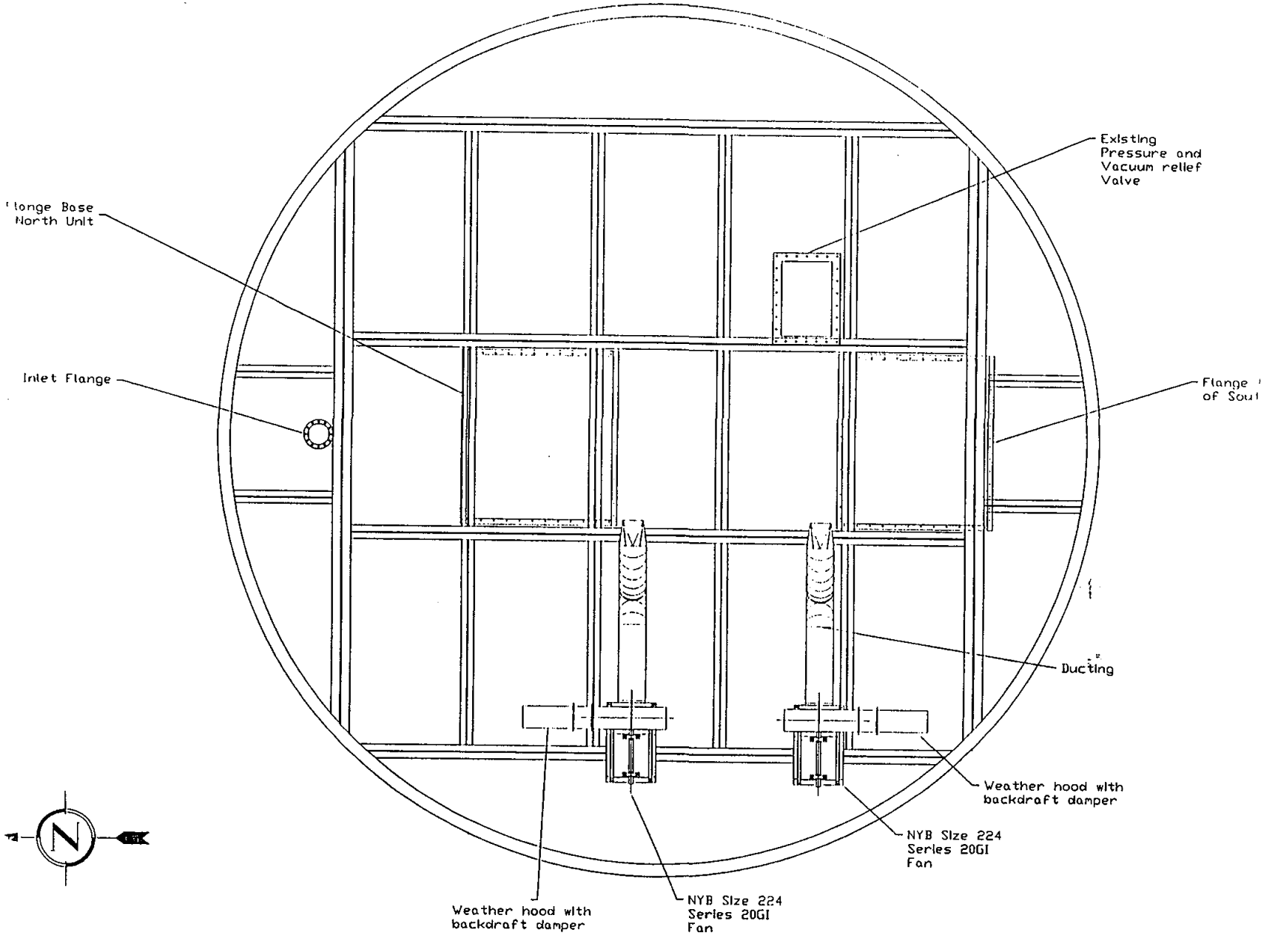
Outlet Temperature: _____ ℉ (minimum) _____ ℉ (maximum)

Inlet air flow rate: 16,500 CFM (one common fan - total air flow from all four units)

Describe maintenance of baghouse (use of dye test, visual inspections, changing bags, etc.):

Inspection and maintenance will be as per the manufacturer's recommended procedures.

# Plan View


Existing
Pressure and
Vacuum relief
Valve
Inlet Flange
Ducting
Weather hood with
backdraft damper
NYB Size 224
Series 20GI
Fan
Weather hood with
backdraft damper
NYB Size 224
Series 20GI
Fan
N

# Elevation

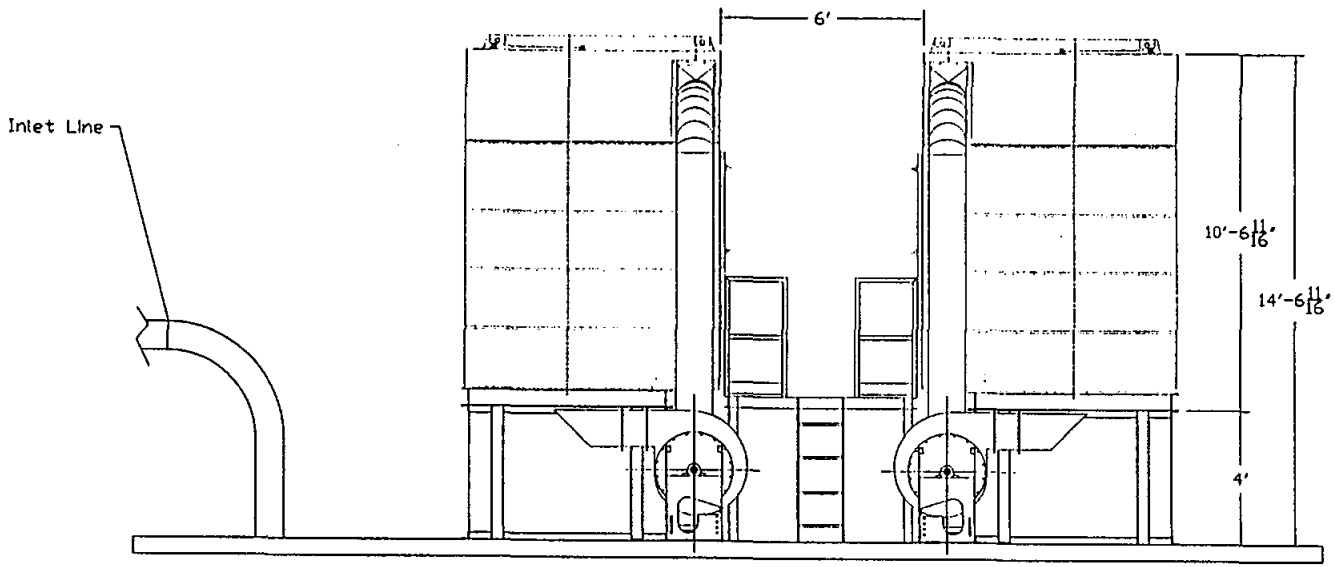
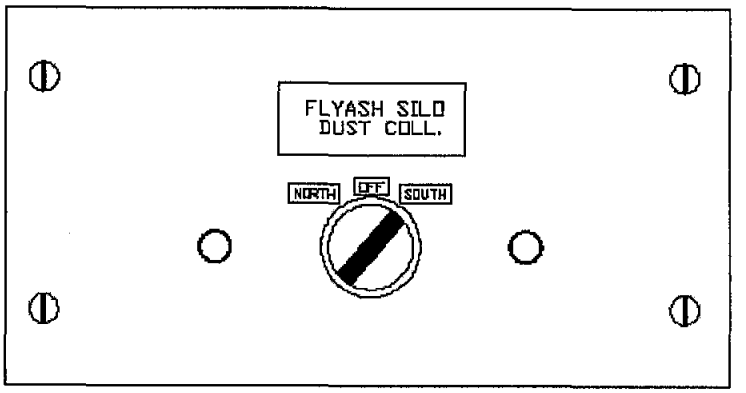


Diagram 1. Flyash Silo Dust Collector Three Position Switch



## MISCELLANEOUS PROCESS OPERATION

1. Facility identification (i.e., Unit #1, Pierre Plant, etc.): Big Stone Plant – Fly Ash Storage Silo

2. Manufacturer: _____

   Date of manufacture: 1974 Model number:

3. Maximum design operating rate:

   Amount of material processed, consumed, or produced? 19 tons per hour
   or
   _____ pounds per hour
   or
   _____ gallons per hour
   or

   **(please specify units)**

   Heat source (if applicable)? _____ million Btus per hour heat input

4. Actual or anticipated operation:

   Type of material processed, consumed, or produced? Ash from facility fuel combustion
   **If applicable, please provide MSDS forms for each type of chemical(s) utilized in the process.**

   Amount of material processed, consumed, or produced? Est. up to 62,000 tons/yr (please specify units)

   Primary and secondary fuel, fuel consumption, and fuel parameters (if applicable):

| Description | Primary Fuel | Secondary Fuel |
|---|---|---|
| Fuel Type **(i.e., natural gas, #2 fuel oil, lignite coal, etc.)** | | |
| Fuel Consumption **(i.e., cubic feet/hour, gallons/hour, pound/hour, tons/hour, etc.)** | | |
| Heating value **(i.e., Btus/cubic feet, Btus/gallon, Btus/pound, etc.)** | | |
| Sulfur Content (Wt.%) | | |
| Ash Content (Wt.%) | | |

5. Has a stack test or other forms of testing been conducted? Yes _____ No X

If a stack test or other forms of testing have been conducted, please attach a copy of the most recent report to this application and skip item #6. If the Department already has a copy of the most recent stack test or other testing methods, please specify the date of the most recent test:

Most recent test date:

6. Stack information (if a stack is present): Baghouse Outlet

Stack height (feet): 114 feet Stack diameter (feet): 1.08 x 0.92 feet

7. Type of air pollution control equipment: Baghouse
(Examples: wet scrubber, cyclone, baghouse, electrostatic precipitator, etc.)

**Please complete the appropriate air pollution control equipment data sheet(s) for this unit.**

**BAGHOUSE DATA SHEET**

**Company name:** Otter Tail Power Company

**Company Location:** Big Stone Plant

**Emission Unit(s) served by this baghouse(please list all units):**

1. Fly Ash Storage Silo
2. _____
3. _____

**Manufacturer Information:**

Manufacturer: Donaldson/DCE – Model DLM C2/4/15 Two units operated as redundant units to the other

Manufacturer date: 2001 Installation date: October 2001

Manufacturer's designed control efficiency: 99.96+ %

Type of baghouse (please check one): Reverse air _____ Pulse Jet X Shaker _____ Other

Type of bags: Polyester

Number of bags: 80 elements 1292 sq. ft.

Air/Cloth Ratio: 2.7 / 1

**Facility Operation and Maintenance:**

Pressure drop across baghouse: 0.5 to 8.0 inches $H_2O$ (normal) 10 inches $H_2O$ (maximum)

Inlet Temperature: ambient ℉ (minimum) _____ ℉ (maximum)

Outlet Temperature: _____ ℉ (minimum) _____ ℉ (maximum)

Inlet air flow rate: 3520 CFM each

Describe maintenance of baghouse (use of dye test, visual inspections, changing bags, etc.):

Inspection and maintenance will be as per the manufacturer's recommended procedures.

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www.otpco.com (web site)


OTTER TAIL
Power Company

November 16, 2001

Mr. Kyrik Rombough
Air Quality Program
South Dakota Department of Environment
and Natural Resources
Joe Foss Building
523 East Capitol
Pierre, SD 57501-3181

Dear Mr. Rombough:

SUBJECT: BIG STONE PLANT - PERMIT NUMBER 28.0801-29
REQUEST FOR MINOR PERMIT AMENDMENT - Corrections
TITLE V PERMIT APPLICATION - Corrections

On November 9, 2001, I submitted a Request for a Minor Permit Amendment to incorporate changes to the emissions control equipment for the coal silos and conveyor dust collection system. During review of the documents for another project, I discovered an error in the Miscellaneous Process Operation form for the South fuel silo vents and Tail-end of Conveyor 10. The stack dimensions were incorrectly stated as 2.0 x 2.0 feet. It should be 2.5 x 2.5 feet. Enclosed are the corrected pages for the Miscellaneous Process Operation for that process.

I am also enclosing the following corrections to the Title V Permit Application that was filed on June 27, 2001:

Air Emissions 2000 – List of Hazardous Air Pollutions at Tab E (Emissions based on PM emissions of 0.015 lb/mmBtu in lieu of 0.15 lb/mmBtu)

Potential to Emit and List of Hazardous Air Pollutions at Tab F (Emissions based on PM emissions permit limit of 0.26 lb/mmBtu in lieu of 0.15 lb/mmBtu)

Miscellaneous Process Operation form for the Rotary Car Dumper Building at Tab G. (Stack height should be 11.25 feet in lieu of 11.33 feet)

Miscellaneous Process Operation form for the South fuel conveying system, silo vents and plant distribution bin at Tab G. (Stack diameter should be 2.5 x 2.5 feet in lieu of 2.0 x 2.0 feet.)

I apologize for the inconvenience of these corrections.

Should you have any questions, please contact me at 218-739-8407.

Sincerely,

Terry Graumann
Manager, Environmental Services

Enclosure

C: Gary Gress MDU w/enclosure
Dennis Wagner – NWPS w/enclosure
Dennis Bowman – w/o enclosure

## MISCELLANEOUS PROCESS OPERATION

1. Facility identification (i.e., Unit #1, Pierre Plant, etc.): Big Stone Plant – South fuel silo vents and Tail end of Conveyor 10

2. Manufacturer: _____

   Date of manufacture: 1974 Model number:

3. Maximum design operating rate:

   Amount of material processed, consumed, or produced? 550 tons per hour
   or
   _____ pounds per hour
   or
   _____ gallons per hour
   or

   **(please specify units)**

   Heat source (if applicable)? _____ million Btus per hour heat input

4. Actual or anticipated operation:

   Type of material processed, consumed, or produced? Materials handling of approved solid, primary and secondary fuel

   **If applicable, please provide MSDS forms for each type of chemical(s) utilized in the process.**

   Amount of material processed, consumed, or produced? Btu equivalent of up to 1,135,000 tons per year of subbituminous coal (please specify units)

   Primary and secondary fuel, fuel consumption, and fuel parameters (if applicable):

| Description | Primary Fuel | Secondary Fuel |
|---|---|---|
| Fuel Type **(i.e., natural gas, #2 fuel oil, lignite coal, etc.)** | | |
| Fuel Consumption **(i.e., cubic feet/hour, gallons/hour, pound/hour, tons/hour, etc.)** | | |
| Heating value **(i.e., Btus/cubic feet, Btus/gallon, Btus/pound, etc.)** | | |
| Sulfur Content (Wt.%) | | |
| Ash Content (Wt.%) | | |

5. Has a stack test or other forms of testing been conducted? Yes _____ No _X_

If a stack test or other forms of testing have been conducted, please attach a copy of the most recent report to this application and skip item #6. If the Department already has a copy of the most recent stack test or other testing methods, please specify the date of the most recent test:

Most recent test date:

6. Stack information (if a stack is present): Baghouse outlet

Stack height (feet): 128 Stack diameter (feet): 2.5 x 2.5 feet

7. Type of air pollution control equipment: Baghouse
(Examples: wet scrubber, cyclone, baghouse, electrostatic precipitator, etc.)

**Please complete the appropriate air pollution control equipment data sheet(s) for this unit.**

BIG STONE PLANT

**AIR EMISSIONS**

**2000**

| | | |
|---|---|---|
| Heat Rate from CEMS | 40,236,712.0 | **Million Btu** |
| Particulate Emission Rate | 0.015 | **Lbs/ Million Btu** |
| Tons of coal burned | 2,130,536 | **Tons Burned** |
| % Ash - Dry Basis | 7.62 | **Dry Basis % ash** |

| | | AP-42[1] | | EPRI Emission Factors [2, 3] | | | |
|---|---|---|---|---|---|---|---|
| CAS number | Parameter | Coal Emission Factor [1] (lbs/ton) | Pounds Emitted | Coal Emission Factor[2] (lbs/trillion Btu) | Element Analysis Dry Basis | Lbs/ Million Btu | | |
| 75070 | Acetaldehyde | | | 3.2000 | | 0.0000032 | 128.76 | pounds |
| 98862 | Acetophenone | | | 1.2000 | | 0.0000012 | 48.28 | pounds |
| 107028 | Acrolein | | | 1.9000 | | 0.0000019 | 76.45 | pounds |
| 71432 | Benzene | | | 3.9000 | | 0.0000039 | 156.92 | pounds |
| 100447 | Benzyl chloride | | | 0.2800 | | 0.00000028 | 11.27 | pounds |
| 92524 | Biphenyl | | | 0.1600 | | 0.00000016 | 6.44 | pounds |
| 117817 | Bis(2-ethylhexyl)phthalate (DEHP) | | | 3.6000 | | 0.0000036 | 144.85 | pounds |
| 75252 | Bromoform | 3.90E-05 | 83.09 | | | | | pounds |
| 75150 | Carbon disulfide | | | 1.1000 | | 0.0000011 | 44.26 | pounds |
| 108907 | Chlorobenzene | | | 0.1600 | | 0.00000016 | 6.44 | pounds |
| 67663 | Chloroform | | | 0.5500 | | 0.00000055 | 22.13 | pounds |
| 13113 | Dimethly phthalate | | | 0.0900 | | 0.00000009 | 3.62 | pounds |
| 77781 | Dimethyl sulfate | 4.80E-05 | 102.27 | | | | | pounds |
| 121142 | 2,4-Dinitrotoluene | | | 0.2000 | | 0.0000002 | 8.05 | pounds |
| 100414 | Ethyl benzene | | | 0.8000 | | 0.0000008 | 32.19 | pounds |
| 75003 | Ethyl chloride (Chlorothane) | 4.20E-05 | 89.48 | | | | | pounds |
| 106934 | Ethylene dibromide (Dibromoethane) | 1.20E-06 | 2.56 | | | | | pounds |
| 107062 | Ethylene dichloride (1,2-Dichlorothane) | 4.00E-05 | 85.22 | | | | | pounds |
| 50000 | Formaldehyde | | | 2.6000 | | 0.0000026 | 104.62 | pounds |
| 110543 | Hexane | 6.70E-05 | 142.75 | | | | | pounds |
| 7647010 | Hydrochloric acid | | | 600.1 | | 0.000600143 | 24147.76 | pounds |
| 7664393 | Hydrogen fluoride (Hydrofluoric Acid) | | | 2743.7 | | 0.002743733 | 110398.80 | pounds |
| 78591 | Isophorone | | | 1.2000 | | 0.0000012 | 48.28 | pounds |
| 74893 | Methyl bromide (Bromomethane) | 1.60E-04 | 340.89 | | | | | pounds |
| 74873 | Methyl chloride (Chloromethane) | 5.30E-04 | 1129.18 | | | | | pounds |
| 71556 | Methly Chloroform (1,1,1-Trichloroethane) | | | 0.6100 | | 0.00000061 | 24.54 | pounds |
| 78933 | Methyl ethyl ketone (2-Butanone) | 3.90E-04 | 830.91 | | | | | pounds |
| 60344 | Methyl hydrazine | 1.70E-04 | 362.19 | | | | | pounds |
| 80626 | Methyl methacrylate | | | 1.1000 | | 0.0000011 | 44.26 | pounds |
| 75092 | Methylene chloride (Dichloromethane) | | | 3.6000 | | 0.0000036 | 144.85 | pounds |
| 91203 | Napthalene | | | 0.6200 | | 0.00000062 | 24.95 | pounds |
| 108952 | Phenol | | | 3.3000 | | 0.0000033 | 132.78 | pounds |
| 123386 | Propionaldehyde | | | 1.8000 | | 0.0000018 | 72.43 | pounds |
| 100425 | Styrene | | | 0.7000 | | 0.0000007 | 28.17 | pounds |
| 1746016 | 2,3,7,8-Tetrachlorodibenzo-p-dioxin | | | 0.000002 | | 0.000000000002 | 0.00 | pounds |
| 127184 | Tetrachloroethylene (Perchloroethylene) | | | 0.4200 | | 0.00000042 | 16.90 | pounds |
| 108883 | Toluene | | | 1.7000 | | 0.0000017 | 68.40 | pounds |
| 120821 | 1,2,4-Trichlorbenzene | | | 1.5000 | | 0.0000015 | 60.36 | pounds |
| 108054 | Vinyl acetate | | | 0.3100 | | 0.00000031 | 12.47 | pounds |
| 75014 | Vinyl chloride | | | 0.7300 | | 0.00000073 | 29.37 | pounds |

BIG STONE PLANT

**AIR EMISSIONS**

**2000**

| | | |
|---|---|---|
| Heat Rate from CEMS | 40,236,712.0 | **Million Btu** |
| Particulate Emission Rate | 0.015 | **Lbs/ Million Btu** |
| Tons of coal burned | 2,130,536 | **Tons Burned** |
| % Ash - Dry Basis | 7.62 | **Dry Basis % ash** |

| | | AP-42[1] | | EPRI Emission Factors [2, 3] | | | | |
|---|---|---|---|---|---|---|---|---|
| CAS number | Parameter | Coal Emission Factor [1] (lbs/ton) | Pounds Emitted | Coal Emission Factor[2] (lbs/trillion Btu) | Element Analysis Dry Basis | Lbs/ Million Btu | | |
| | Polynuclear Aromatic Hydrocarbons (PAH) combined | 2.08E-05 | 44.23 | | | | | |
| | Antimony Compound[3] | | | $(0.92)X^{0.63}$ | <1 | 0.00000001 | 0.34 | pounds |
| | Arsenic Compound (including arsine) | | | $(3.1)X^{0.85}$ | <1.44 | 0.00000001 | 0.30 | pounds |
| | Beryllium Compound | | | $(1.2)X^{1.1}$ | <0.27 | 0.000000000 | 0.00 | pounds |
| | Cadmium Compound | | | $(3.3)X^{0.5}$ | <0.21 | 0.000000036 | 1.45 | pounds |
| | Chromium Compound | | | $(3.7)X^{0.58}$ | 6.06 | 0.000000207 | 8.32 | pounds |
| | Cobalt Compound | | | $(1.7)X^{0.69}$ | <2.31 | 0.000000018 | 0.70 | pounds |
| | Lead | | | $(3.4)X^{0.80}$ | <3.44 | 0.000000023 | 0.93 | pounds |
| | Manganese Compound | | | $(3.8)X^{0.60}$ | 23.31 | 0.000000432 | 17.36 | pounds |
| | Mercury Compound | | | 20% reduction[4] | 0.07 | | 238.62 | pounds |
| | Nickel Compound | | | $(4.4)X^{0.48}$ | <1.44 | 0.000000439 | 17.67 | pounds |
| | Polycyclic Organic Matter (4) | | | | | | 0.00 | pounds |
| | Selenium Compound | | | 3% | <1.2 | | 0.00004 | pounds |
| | Total Non-Methane Organic Carbons (TNMOC) | 1.10E-01 | 234,358.96 | | | | | |

| | |
|---|---|
| Total pounds | 373,906.02 pounds |
| Total tons | 186.95 tons |

[1] AP-42 Emission Factors

[2] Emission Factor Estimates from EPRI Study of Power Plant Emissions, TR-105611, November 1995. These formulas are also listed in Table 1.1-16 of AP-42, page 1.1-37, 9/98.

[3] EPRI Formulas where X= Coal ash ppm/ash fraction * PM and "not detected" trace element values will use 1/2 the detection limit.

[4] Energy & Environment Research Center recommend that units equipped with electrostatic precipitators assume 20% reduction in emissions. This is a higher figure than the AP-42 calculation.

## BIG STONE PLANT

FUEL-FIRED EMISSION SOURCES

**Potential to Emit**

| PERMIT ID NUMBER | DESCRIPTION | FUEL TYPE | FUEL USE TONS or GALS | BTU/LB OR GAL | TOTAL MMBTU | % SULFUR AS REC | PARTICULATE (assume all PM10) TONS PER YR | SO2 TONS PER YR | NOX TONS PER YEAR | CO TONS PER YEAR |
|---|---|---|---|---|---|---|---|---|---|---|
| 001 | BIG STONE #1 | COAL | 2,270,000 TONS COAL | 8800 | 39,952,000 MMBTU | 0.5 | 5194 TONS/YR | 19,863 TONS/YR | 17,179 TONS/YR | 568 Tons/Yr from Coal |
| | EMISSION RATE | | | | | | 1185.8 LBS/HR | 1.0 LBS/MMBTU | | |
| | | FUEL OIL | 0 GALLONS | | | | | | | 0.0 Tons/Yr from Oil |
| 002 | AUX BOILER | FUEL OIL | 13,140,000 GALLONS | 140,000 | 1,839,600.0 MMBTU | 0.45 | 13.1 TONS/YR | 419.8 TONS/YR | 131.4 TONS/YR | 32.9 TONS/YR |
| | EMISSION RATE | | | | | | 3.0 LBS/HR | 0.5 LBS/MMBTU | | |
| 003 | HEATING BOILER | FUEL OIL | 6,132,000 GALLONS | 140,000 | 858,480 MMBTU | 0.45 | 6.132 TONS/YR | 195.92 TONS/YR | 61.32 TONS/YR | 16.33 TONS/YR |
| | EMISSION RATE | | | | | | 1.4 LBS/HR | 0.5 LBS/MMBTU | | |
| 004 | EMERGENCY DIESEL GENERATOR | | 531,732 GALLONS | 140,000 | 74,442.5 MMBTU | 0.45 | 2.594 TONS/YR | 16.92 TONS/YR | 116.39 TONS/YR | 1.33 TONS/YR |
| | | | | | | | 0.6 LBS/HR | 0.5 LBS/MMBTU | | |

**FORMULAS**

**PARTICULATE**

SOLID FUELS

MMBTU * 0.26LBS/MMBTU/2000 LBS/TON = TONS PARTICULATE

*Heating Boiler/ Oil*

GALS/FUEL * 2 LB PER 1,000 GALS / 1000 / 2000 LBS/TON = TONS PARTICULATE

Emer. Diesel Gen

MMBtu * 0.0697 LB/MMBtu / 2000 LBS/TON = TONS PARTICULATE

**SO2**

SOLID FUELS 35 S (0.5) * tons of coal/2000 LBS/TON = TONS SO2

Heating Boiler/ Oil

GALS/FUEL * 142 * %S (i.e. 0.40) PER 1,000 GALS/ 1000 / 2000 LB/TON = TONS SO2

Emer. Diesel Gen

MMBtu * 1.01 LB/ MMBtu * % S / 2000 LBS/TON = TONS SO2

**NOX**

SOLID FUELS Permit limit of 0.86 lb/MM Btu

Heating Boiler/ Oil

GALS/FUEL * 20 LB PER 1,000 GALS/1000 / 2000 LB/TON = TONS NOX

*Emer. Diesel Gen*

MMBtu * 3.1 LB/MMBtu / 2000 LB/TON = TONS NOX

**CO**

SOLID FUELS 0.6 LBS/TONS OF FUEL

DISTILLATE OIL 5 LBS/1000 GAL OF FUEL

**OPERATING HOURS**

| | |
|---|---|
| BIG STONE #1 | 8760 |
| AUX BOILER 210 MMBtu/hr | 8760 |
| HTG BOILER 98 MMBtu/hr | 8760 |
| EMERGENCY DIESEL GENERATOR rated at 60.7 gal/hr | 8760 |

Prepared by: Beverly Rund November 16, 2001

BIG STONE PLANT

**AIR EMISSIONS**

**Potential to Emit**

| | | |
|---|---|---|
| Heat Rate (Calculated) | 39,952,000 | **Million Btu** |
| Particulate Emission Rate | 0.26 | **Lbs/ Million Btu** |
| *Tons of coal burned* | *2,270,000* | ***Tons Burned*** |
| % Moisture | 29.9 | **Percent** |
| % Ash - Dry Basis | 7.85 | **Dry Basis % ash** |

| | | **AP-42**[1] | | ***EPRI Emission Factors*** [2, 3] | | | | |
|---|---|---|---|---|---|---|---|---|
| CAS number | Parameter | Coal Emission Factor [1] (lbs/ton) | Pounds Emitted | Coal Emission Factor[2] (lbs/trillion Btu) | Element Analysis Dry Basis | Lbs/ Million Btu | | |
| 75070 | Acetaldehyde | | | 3.2000 | | 0.0000032 | 127.85 | pounds |
| 98862 | Acetophenone | | | 1.2000 | | 0.0000012 | 47.94 | pounds |
| 107028 | Acrolein | | | 1.9000 | | 0.0000019 | 75.91 | pounds |
| 71432 | Benzene | | | 3.9000 | | 0.0000039 | 155.81 | pounds |
| 100447 | Benzyl chloride | | | 0.2800 | | 0.00000028 | 11.19 | pounds |
| 92524 | Biphenyl | | | 0.1600 | | 0.00000016 | 6.39 | pounds |
| 117817 | Bis(2-ethylhexyl)phthalate (DEHP) | | | 3.6000 | | 0.0000036 | 143.83 | pounds |
| 75252 | Bromoform | 3.90E-05 | 88.53 | | | | | pounds |
| 75150 | Carbon disulfide | | | 1.1000 | | 0.0000011 | 43.95 | pounds |
| 108907 | Chlorobenzene | | | 0.1600 | | 0.00000016 | 6.39 | pounds |
| 67663 | Chloroform | | | 0.5500 | | 0.00000055 | 21.97 | pounds |
| 13113 | Dimethly phthalate | | | 0.0900 | | 0.00000009 | 3.60 | pounds |
| 77781 | Dimethyl sulfate | 4.80E-05 | 108.96 | | | | | pounds |
| 121142 | 2,4-Dinitrotoluene | | | 0.2000 | | 0.0000002 | 7.99 | pounds |
| 100414 | Ethyl benzene | | | 0.8000 | | 0.0000008 | 31.96 | pounds |
| 75003 | Ethyl chloride (Chlorothane) | 4.20E-05 | 95.34 | | | | | pounds |
| 106934 | Ethylene dibromide (Dibromoethane) | 1.20E-06 | 2.72 | | | | | pounds |
| 107062 | Ethylene dichloride (1,2-Dichlorothane) | 4.00E-05 | 90.80 | | | | | pounds |
| 50000 | Formaldehyde | | | 2.6000 | | 0.0000026 | 103.88 | pounds |
| 110543 | Hexane | 6.70E-05 | 152.09 | | | | | pounds |
| 7647010 | *Hydrochloric acid* | | | *600.1* | | *0.000600143* | *23976.89* | pounds |
| 7664393 | Hydrogen fluoride (Hydrofluoric Acid) | | | 2743.7 | | 0.002743733 | 109617.63 | pounds |
| 78591 | Isophorone | | | 1.2000 | | 0.0000012 | 47.94 | pounds |
| 74893 | Methyl bromide (Bromomethane) | 1.60E-04 | 363.20 | | | | | pounds |
| 74873 | *Methyl chloride (Chloromethane)* | *5.30E-04* | *1203.10* | | | | | pounds |
| 71556 | Methly Chloroform (1,1,1-Trichloroethane) | | | 0.6100 | | 0.00000061 | 24.37 | pounds |
| 78933 | Methyl ethyl ketone (2-Butanone) | 3.90E-04 | 885.30 | | | | | pounds |
| 60344 | Methyl hydrazine | 1.70E-04 | 385.90 | | | | | pounds |
| 80626 | *Methyl methacrylate* | | | *1.1000* | | *0.0000011* | 43.95 | pounds |
| 75092 | Methylene chloride (Dichloromethane) | | | 3.6000 | | 0.0000036 | 143.83 | pounds |
| 91203 | Napthalene | | | 0.6200 | | 0.00000062 | 24.77 | pounds |
| 108952 | Phenol | | | 3.3000 | | 0.0000033 | 131.84 | pounds |
| 123386 | *Propionaldehyde* | | | *1.8000* | | *0.0000018* | *71.91* | pounds |
| 100425 | Styrene | | | 0.7000 | | 0.0000007 | 27.97 | pounds |
| 1746016 | 2,3,7,8-Tetrachlorodibenzo-p-dioxin | | | 0.000002 | | 0.000000000002 | 0.00 | pounds |
| 127184 | Tetrachloroethylene (Perchloroethylene) | | | 0.4200 | | 0.00000042 | 16.78 | pounds |
| 108883 | *Toluene* | | | *1.7000* | | *0.0000017* | 67.92 | pounds |
| 120821 | 1,2,4-Trichlorbenzene | | | 1.5000 | | 0.0000015 | 59.93 | pounds |
| 108054 | Vinyl acetate | | | 0.3100 | | 0.00000031 | 12.39 | pounds |
| 75014 | Vinyl chloride | | | 0.7300 | | 0.00000073 | 29.16 | pounds |

BIG STONE PLANT

**AIR EMISSIONS**

**Potential to Emit**

| | | |
|---|---|---|
| Heat Rate (Calculated) | 39,952,000 | **Million Btu** |
| Particulate Emission Rate | 0.26 | **Lbs/ Million Btu** |
| Tons of coal burned | 2,270,000 | **Tons Burned** |
| % Moisture | 29.9 | **Percent** |
| % Ash - Dry Basis | 7.85 | **Dry Basis % ash** |

| CAS number | Parameter | AP-42[1] Coal Emission Factor [1] (lbs/ton) | AP-42[1] Pounds Emitted | EPRI Emission Factors [2, 3] Coal Emission Factor[2] (lbs/trillion Btu) | Element Analysis Dry Basis | Lbs/ Million Btu | | |
|---|---|---|---|---|---|---|---|---|
| | Polynuclear Aromatic Hydrocarbons (PAH) combined | 2.08E-05 | 47.12 | | | | | |
| | Antimony Compound[3] | | | $(0.92)X^{0.63}$ | <1 | 0.00000005 | 2.05 | pounds |
| | Arsenic Compound (including arsine) | | | $(3.1)X^{0.85}$ | <1.44 | 0.00000009 | 3.43 | pounds |
| | Beryllium Compound | | | $(1.2)X^{1.1}$ | <0.27 | 0.000000002 | 0.07 | pounds |
| | Cadmium Compound | | | $(3.3)X^{0.5}$ | <0.21 | 0.000000153 | 6.10 | pounds |
| | Chromium Compound | | | $(3.7)X^{0.58}$ | 6.06 | 0.000001101 | 43.97 | pounds |
| | Cobalt Compound | | | $(1.7)X^{0.69}$ | <2.31 | 0.000000128 | 5.11 | pounds |
| | Lead | | | $(3.4)X^{0.80}$ | <3.44 | 0.000000233 | 9.31 | pounds |
| | Manganese Compound | | | $(3.8)X^{0.60}$ | 23.31 | 0.000002433 | 97.19 | pounds |
| | Mercury Compound | | | 20% reduction[4] | 0.07 | | 254.24 | pounds |
| | Nickel Compound | | | $(4.4)X^{0.48}$ | <1.44 | 0.000001752 | 70.00 | pounds |
| | Polycyclic Organic Matter (4) | | | | | | 0.00 | pounds |
| | Selenium Compound | | | 3% | <1.2 | | 0.00004 | pounds |
| | Total Non-Methane Organic Carbons (TNMOC) | 1.10E-01 | 249,700.00 | | | | | |

| | |
|---|---|
| Total pounds | 388,700.47 pounds |
| Total tons | 194.35 tons |

[1] *AP-42 Emission Factors*

[2] Emission Factor Estimates from EPRI Study of Power Plant Emissions, TR-105611, November 1995. These formulas are also listed in Table 1.1-16 of AP-42, page 1.1-37, 9/98.

[3] EPRI Formulas where X= Coal ash ppm/ash fraction * PM and "not detected" trace element values will use 1/2 the detection limit.

[4] Energy & Environment Research Center recommend that units equipped with electrostatic precipitators assume 20% reduction in emissions. This is a higher figure than the AP-42 calculation.

## MISCELLANEOUS PROCESS OPERATION

1. Facility identification (i.e., Unit #1, Pierre Plant, etc.): Big Stone Plant – Rotary Car Dumper Building

2. Manufacturer: _____

   Date of manufacture: 1974 Model number:

3. Maximum design operating rate:

   Amount of material processed, consumed, or produced? 3000 tons per hour
   or
   _____ pounds per hour
   or
   _____ gallons per hour
   or

   **(please specify units)**

   Heat source (if applicable)? _____ million Btus per hour heat input

4. Actual or anticipated operation:

   Type of material processed, consumed, or produced? Materials handling of approved solid, primary and secondary fuel

   **If applicable, please provide MSDS forms for each type of chemical(s) utilized in the process.**

   Amount of material processed, consumed, or produced? Btu equivalent of up to 2,270,000 tons per year of subbituminous coal (please specify units)

   Primary and secondary fuel, fuel consumption, and fuel parameters (if applicable):

| Description | Primary Fuel | Secondary Fuel |
|---|---|---|
| Fuel Type **(i.e., natural gas, #2 fuel oil, lignite coal, etc.)** | | |
| Fuel Consumption **(i.e., cubic feet/hour, gallons/hour, pound/hour, tons/hour, etc.)** | | |
| Heating value **(i.e., Btus/cubic feet, Btus/gallon, Btus/pound, etc.)** | | |
| Sulfur Content (Wt.%) | | |
| Ash Content (Wt.%) | | |

5. Has a stack test or other forms of testing been conducted? Yes _____ No _X_

If a stack test or other forms of testing have been conducted, please attach a copy of the most recent report to this application and skip item #6. If the Department already has a copy of the most recent stack test or other testing methods, please specify the date of the most recent test:

Most recent test date:

6. Stack information (if a stack is present): Baghouse outlet

Stack height (feet): 11.25 feet Stack diameter (feet): 3.17 feet

7. Type of air pollution control equipment: Baghouse
(Examples: wet scrubber, cyclone, baghouse, electrostatic precipitator, etc.)

**Please complete the appropriate air pollution control equipment data sheet(s) for this unit.**

## MISCELLANEOUS PROCESS OPERATION

1. Facility identification (i.e., Unit #1, Pierre Plant, etc.): Big Stone Plant – South fuel conveying system, silo vents, and plant distribution bin

2. Manufacturer: _____

   Date of manufacture: 1974 Model number:

3. Maximum design operating rate:

   Amount of material processed, consumed, or produced? 550 tons per hour
   or
   _____ pounds per hour
   or
   _____ gallons per hour
   or

   **(please specify units)**

   Heat source (if applicable)? _____ million Btus per hour heat input

4. Actual or anticipated operation:

   Type of material processed, consumed, or produced? Materials handling of approved solid, primary and secondary fuel

   **If applicable, please provide MSDS forms for each type of chemical(s) utilized in the process.**

   Amount of material processed, consumed, or produced? Btu equivalent of up to 2,270,000 tons per year of subbituminous coal (please specify units)

   Primary and secondary fuel, fuel consumption, and fuel parameters (if applicable):

| Description | Primary Fuel | Secondary Fuel |
|---|---|---|
| Fuel Type **(i.e., natural gas, #2 fuel oil, lignite coal, etc.)** | | |
| Fuel Consumption **(i.e., cubic feet/hour, gallons/hour, pound/hour, tons/hour, etc.)** | | |
| Heating value **(i.e., Btus/cubic feet, Btus/gallon, Btus/pound, etc.)** | | |
| Sulfur Content (Wt.%) | | |
| Ash Content (Wt.%) | | |

5. Has a stack test or other forms of testing been conducted? Yes _____ No X

If a stack test or other forms of testing have been conducted, please attach a copy of the most recent report to this application and skip item #6. If the Department already has a copy of the most recent stack test or other testing methods, please specify the date of the most recent test:

Most recent test date:

6. Stack information (if a stack is present): Baghouse outlet

Stack height (feet): 128 Stack diameter (feet): 2.5 x 2.5 feet

7. Type of air pollution control equipment: Baghouse
(Examples: wet scrubber, cyclone, baghouse, electrostatic precipitator, etc.)

**Please complete the appropriate air pollution control equipment data sheet(s) for this unit.**

215 South Cascade Street
PO Box 496
Fergus Falls, Minnesota 56538-0496
218 739-8200
www.otpco.com (web site)


OTTER TAIL
Power Company

January 3, 2002

Mr. Kyrik Rombough
Air Quality Program
South Dakota Department of Environment
and Natural Resources
Joe Foss Building
523 East Capitol
Pierre, SD 57501-3181

Dear Mr. Rombough:

SUBJECT: BIG STONE PLANT - PERMIT NUMBER 28.0801-29
TITLE V PERMIT APPLICATION - Corrections

I am also enclosing the following corrections to the Title V Permit Application that was filed on June 27, 2001:

Estimated Fugitive Emissions 1999 at Tab E – Added Replenish Coal Pile: Live Storage Drop Point

Estimated Fugitive Emissions 2000 at Tab E – Added Replenish Coal Pile: Live Storage Drop Point

Estimated Fugitive Emissions Potential to Emit at Tab F – Added page to reflect potential fugitive emissions

I apologize for the inconvenience of these corrections.

Should you have any questions, please contact me at 218-739-8407.

Sincerely,

Terry Graumann
Manager, Environmental Services

Enclosure

C: Gary Gress MDU w/enclosure
Dennis Wagner – NWPS w/enclosure
Dennis Bowman – w/o enclosure

**BIG STONE PLANT**
**ESTIMATED FUGITIVE EMISSIONS**
**1999**

| SOURCE | | SCC NO. | PM EMIS. RATE | PM10 EMIS. RATE | UNIT OF MEASURE | SOURCE RATE | NUMBER OF UNITS | TONS PM/YR | TONS PM10/YR |
|---|---|---|---|---|---|---|---|---|---|
| Coal Stockpile | Open storage pile - coal | 3-05-010-43 | NA | 17,060 | lbs/acre | Est. 5 acres | 5 | --- | 42.65 |
| Reclaiming Coal from Stockpile: Dozing | Buldozing coal (50%) | 3-05-010-46* | 49.4 | No Emis. Rate - Est. 75% of PM | lbs/hr dozing | 5000 tons/day | 146.08 | 3.61 | 2.71 |
| Reclaiming Coal from Stockpile: Scraper | Scraper - remove coal from SP and bottom dump into live storage (50%) | 3-05-010-41 | 0.066 | 0.01 | lb/ton | 182,596.16 tons from SP * 50% scraper/2000 lb/ton | 91,298.08 | 3.01 | 0.46 |
| Replenish Coal Pile: Live Storage Drop Point | Coal dropped from live storage to be transferred to scraper or dozer | 3-05-010-38 | 0.04 | 0.005 | lb/ton loaded | 189270.47 tons to SP | 189,270.47 | 3.79 | 0.47 |
| Replenish Coal Pile: Load into scraper | Truck loading - Coal | 3-05-010-38 | 0.04 | 0.005 | lb/ton loaded | 189,270.47 tons to SP *25 % scraper | 47,317.62 | 0.95 | 0.12 |
| Replenishing Coal Pile: Coal Transfer - scraper | Truck unloading bottom dump - coal (25% time) | 3-05-010-41 | 0.066 | 0.01 | lb/ton | 189,270.47 tons to SP *25 % scraper | 47,317.62 | 1.56 | 0.24 |
| Replenishing Coal Pile: Dozing | Buldozing coal (75% time) | 3-05-010-46* | 49.4 | NA | lbs/hr dozing | 189,270.47 tons to SP /5000 tons dozed /day * 8 hr/day*.75 | 0.11 | 0.00 | --- |
| Coal Conveying: Used Coal Crushing for Est. | Crushing - coal | 3-05-010-10 | 0.02 | 0.006 | lbs/ton | Tons of coal burned | 2,038,402.46 | 20.38 | 6.12 |
| Loading Fly Ash into Scraper | Cement unloading - storage bins | 3-05-011-07 | 0.24 | 0.14 | lbs/ton | | 56,217.34 | 6.75 | 3.94 |
| Unloading Fly Ash from Scraper | Raw Mat.unload (cement mfg - dry) | 3-05-006-07 | NA | 0.1 | lb/ton unloaded | 56,217.34 tons fly ash | 56,217.34 | --- | 0.28 |
| Loading Bottom Ash into Scraper | Bulk Loading - const. Sand & gravel | 3-05-025-06 | 0.02 | 0.0024 | lb/ton | 101,279.05*.002(or 0.0024) lb/ton /2000 | 93,452.24 | 0.93 | 0.11 |
| Scraper Travel Mode | Scraper travel mode - coal | 3-05-010-31** | 14.6 | No Emis. Rate - Est. 25% of PM | lb/vehicle mile | 1 mile each trip of 25 tons | 5,986.78 | 43.70 | 10.93 |
| Ash Disposal Site | Open storage pile - coal | 3-05-010-43 | NA | 17,060 | lbs/acre | 4.75 acres | 4.75 | | 40.52 |
| Ash Disposal Site Reclamation | Overburden replace. - coal mining | 3-05-010-48 | 0.012 | 0.006 | lbs/ton overburden | 4.5 acres, 2' clay, 0.5 ft top soil | 23,268.30 | 0.14 | 0.07 |
| Revised 1-3-2002 ber | | | | | | | | PM | PM10 |
| | | | | | | | Total 1999 Tons | **84.82** | **108.60** |

*PM10 emissions using a conversion factor of 0.75 based on EPA's AP-42, 11.9-5, 7/98 - Table 11.9-1
**PM10 emissions using a conversion factor of 0.25 based on EPA's AP-42, 13.2.2-3, 9/98 - Equation 1

**BIG STONE PLANT**
**ESTIMATED FUGITIVE EMISSIONS**
**2000**

| SOURCE | | SCC NO. | PM EMIS. RATE | PM10 EMIS. RATE | UNIT OF MEASURE | SOURCE RATE | NUMBER OF UNITS | TONS PM/YR | TONS PM10/YR |
|---|---|---|---|---|---|---|---|---|---|
| Coal Stockpile | Open storage pile - coal | 3-05-010-43 | NA | 17,060 | lbs/acre | Est. 5 acres | 5 | ---- | 42.65 |
| Reclaiming Coal from Stockpile: Dozing | Buldozing coal (50%) | 3-05-010-46* | 49.4 | No Emis. Rate - Est. 75% of PM | lbs/hr dozing | Tons from SP / 4800 tons/ 8 hr. day* 50% dozing | 128.25 | 3.17 | 2.38 |
| Reclaiming Coal from Stockpile: Scraper | from SP and bottom dump into live storage (50%) | 3-05-010-41 | 0.066 | 0.01 | lb/ton | Tons from SP * 50% scraper | 76,952.00 | 2.54 | 0.38 |
| Replenish Coal Pile: Live Storage Drop Point | Coal dropped from live storage to be transferred to scraper or dozer | 3-05-010-38 | 0.04 | 0.005 | lb/ton loaded | Tons into SP | 58,381.90 | 1.17 | 0.15 |
| Replenish Coal Pile: Load into scraper | Truck loading - Coal (25%) | 3-05-010-38 | 0.04 | 0.005 | lb/ton loaded | Tons to SP *25 % scraper | 14,595.48 | 0.29 | 0.04 |
| Replenishing Coal Pile: Coal Transfer - scraper | Truck unloading bottom dump - coal (25% time) | 3-05-010-41 | 0.066 | 0.01 | lb/ton | Tons to SP *25 % scraper | 14,595.48 | 0.48 | 0.07 |
| Replenishing Coal Pile: Dozing | Buldozing coal (75% time) | 3-05-010-46* | 49.4 | No Emis. Rate - Est. 75% of PM | lbs/hr dozing | Tons to SP /5000 tons dozed /day * 8 hr/day* 75 % | 70.06 | 1.73 | 1.3 |
| Coal Conveying: Used Coal Crushing for Est. | Crushing - coal | 3-05-010-10 | 0.02 | 0.006 | lbs/ton | Tons of coal burned for year | 2,130,536 | 21.31 | 6.39 |
| Loading Fly Ash into Scraper | Cement unloading - storage bins | 3-05-011-07 | 0.24 | 0.14 | lbs/ton | Tons fly ash landfilled | 26,734.88 | 3.21 | 1.87 |
| Unloading Fly Ash from Scraper | Raw Mat.unload (cement mfg - dry) | 3-05-006-07 | NA | 0.1 | lb/ton unloaded | Tons fly ash landfilled | 26,734.88 | ---- | 1.34 |
| Loading Bottom Ash into Scraper | Bulk Loading - const. Sand & gravel | 3-05-025-06 | 0.02 | 0.0024 | lb/ton | Tons bottom ash landfilled | 58,062.62 | 0.58 | 0.07 |
| Scraper Travel Mode | Scraper travel mode - coal | 3-05-010-31** | 14.6 | No Emis. Rate - Est. 25% of PM | lb/vehicle mile | Tons of ash landfilled / 25 tons per load per mile | 3,391.90 | 24.76 | 6.19 |
| Ash Disposal Site | Open storage pile - coal | 3-05-010-43 | NA | 17,060 | lbs/acre | 4.75 acres | 4.75 | ---- | 40.52 |
| Ash Disposal Site Reclamation | Overburden replace. - coal mining | 3-05-010-48 | 0.012 | 0.006 | lbs/ton overburden | No Closure in 2000 | 0 | 0 | 0 |

Revised 1-3-2002 ber

| | PM | PM10 |
|---|---|---|
| Total Tons | **59.23** | **103.34** |

*PM10 emissions using a conversion factor of 0.75 based on EPA's AP-42, 11.9-5, 7/98 - Table 11.9-1

**PM10 emissions using a conversion factor of 0.25 based on EPA's AP-42, 13.2.2-3, 9/98 - Equation 1

**BIG STONE PLANT**
**ESTIMATED FUGITIVE EMISSIONS**
**Potential to Emit**

| SOURCE | | SCC NO. | PM EMIS. RATE | PM10 EMIS. RATE | UNIT OF MEASURE | SOURCE RATE | NUMBER OF UNITS | TONS PM/YR | TONS PM10/YR |
|---|---|---|---|---|---|---|---|---|---|
| Coal Stockpile | Open storage pile - coal | 3-05-010-43 | NA | 17,060 | lbs/acre | Est. 5 acres | 5 | ---- | 42.65 |
| Reclaiming Coal from Stockpile: Dozing | Buldozing coal (50%) | 3-05-010-46* | 49.4 | No Emis. Rate - Est. 75% of PM | lbs/hr dozing | Tons from SP / 4800 tons/ 8 hr. day* 50% dozing | 1,891.67 | 46.72 | 35.04 |
| Reclaiming Coal from Stockpile: Scraper | from SP and bottom dump into live storage (50%) | 3-05-010-41 | 0.066 | 0.01 | lb/ton | Tons from SP * 50% scraper | 1,135,000.00 | 37.46 | 5.68 |
| Replenish Coal Pile: Live Storage Drop Point | Coal dropped from live storage to be transferred to scraper or dozer | 3-05-010-38 | 0.04 | 0.005 | lb/ton loaded | Tons into SP | 2,270,000.00 | 45.40 | 5.68 |
| Replenish Coal Pile: Load into scraper | Truck loading - Coal (25%) | 3-05-010-38 | 0.04 | 0.005 | lb/ton loaded | Tons to SP *25 % scraper | 567,500.00 | 11.35 | 1.42 |
| Replenishing Coal Pile: Coal Transfer - scraper | Truck unloading bottom dump - coal (25% time) | 3-05-010-41 | 0.066 | 0.01 | lb/ton | Tons to SP *25 % scraper | 567,500.00 | 18.73 | 2.84 |
| Replenishing Coal Pile: Dozing | Buldozing coal (75% time) | 3-05-010-46* | 49.4 | No Emis. Rate - Est. 75% of PM | lbs/hr dozing | Tons to SP /5000 tons dozed /day * 8 hr/day* 75 % | 2,724.00 | 67.28 | 50.5 |
| Coal Conveying: Used Coal Crushing for Est. | Crushing - coal | 3-05-010-10 | 0.02 | 0.006 | lbs/ton | Tons of coal burned for year | 2,270,000 | 22.70 | 6.81 |
| Loading Fly Ash into Scraper | Cement unloading - storage bins | 3-05-011-07 | 0.24 | 0.14 | lbs/ton | Tons fly ash landfilled | 43,697.50 | 5.24 | 3.06 |
| Unloading Fly Ash from Scraper | Raw Mat.unload (cement mfg - dry) | 3-05-006-07 | NA | 0.1 | lb/ton unloaded | Tons fly ash landfilled | 43,697.50 | ---- | 2.18 |
| Loading Bottom Ash into Scraper | Bulk Loading - const. Sand & gravel | 3-05-025-06 | 0.02 | 0.0024 | lb/ton | Tons bottom ash landfilled | 81,152.50 | 0.81 | 0.10 |
| Scraper Travel Mode | Scraper travel mode - coal | 3-05-010-31** | 14.6 | No Emis. Rate - Est. 25% of PM | lb/vehicle mile | Tons of ash landfilled / 25 tons per load per mile | 4,994.00 | 36.46 | 9.11 |
| Ash Disposal Site | Open storage pile - coal | 3-05-010-43 | NA | 17,060 | lbs/acre | 4.75 acres | 4.75 | ---- | 40.52 |
| Ash Disposal Site Reclamation | Overburden replace. - coal mining | 3-05-010-48 | 0.012 | 0.006 | lbs/ton overburden | 4.75 acres @ 28,000 | 28,000 | 0.17 | 0.08 |
| Revised 1-3-2002 ber | | | | | | | | PM | PM10 |
| | | | | | | | Total Tons | **292.32** | **205.63** |

*PM10 emissions using a conversion factor of 0.75 based on EPA's AP-42, 11.9-5, 7/98 - Table 11.9-1

**PM10 emissions using a conversion factor of 0.25 based on EPA's AP-42, 13.2.2-3, 9/98 - Equation 1